FOOD INDUSTRIES

manufacturing and processing

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Van Camp Decision May Have Far-Reaching Consequences

SPECULATION is rife as to the possible effect on business of the broader interpretation of Section 2 of the Clayton Act handed down by the United States Supreme Court on January 2, now known as the Van Camp decision. Previous interpretations were covered by the Colgate decision, which sustained the seller's right to select his own customers, and by the Mennen, and National Biscuit decisions, which upheld the right of the seller to charge one price to one division of the trade, such as the wholesale, and a different price to another, such as the retail.

In the suit of George Van Camp & Sons Company against the American Can Company and the Van Camp Packing Company, it was alleged that the American Can Company sold cans at twenty per cent less to the Van Camp Packing Company than to George Van Camp & Sons Company. Complaint was made of this and other alleged discriminations which tended toward a monopoly. The case was dismissed from the district court for want of equity. The Court of Appeals was in doubt as to the application of Section 2 of the Clayton Act, and the case was certified to the Supreme Court for an opinion as to the application of this section to the case in question.

The Supreme Court was confronted with the contention that the legal protection from discrimination afforded by the Clayton Act applies solely to the particular line of commerce in which the discriminator is engaged. In other words, it was conceded that the act protects can makers from the acts of other can makers, and canners from those of other canners; but the claim was made that it does not protect canners from the acts of can making companies. The court—unanimously, be it noted—ruled that the phrase "in any line of commerce" meant precisely what the words convey to any adult intelligence—"in *any* line of commerce."

The suit itself now goes back to the district court for trial, for, up to the time of rendering the decision, no evidence has been taken.

As Mr. Charles Wesley Dunn, counsel for the American Grocery Manufacturers Association, pointed out at a luncheon of the International Advertising Association, the ruling of the Supreme Court will have several important effects, including one of considerable interest. The way is now opened for much vexatious litigation, based upon the idea that unjust discrimination has been used in naming prices. If loss can be proved, the law provides for the recovery of treble damages—a feature which may possibly be a lure to the dissatisfied.

However, an additional responsibility is now placed on the seller, for it is possible to sell oneself into a lawsuit. A feeling also exists among many manufacturers that this interpretation of Section 2 of the Clayton Act may have the effect of giving them a weapon of defense when price concessions are demanded.

Firmer Credit Policy Essential to Sound Business

FROM THE WEST comes news to the effect that certain co-operative agricultural groups are taking exception to the sales policies of a newly formed equipment merger. The co-operatives had planned to establish a manufacturing plant that would be equipped with machinery paid for by notes—a plant the raw materials for which and much of its labor would be furnished by themselves. No mention is made of the intended management.

It is difficult to picture a set-up more ideal for price-cutting than one in which little real cash has been expended. Apparently, the new equipment company has determined that sales shall not be made without substantial payments in cash for new machinery. If this policy be held strictly, the result should be salutary. Competition from concerns that have little to lose is seldom competition that results in a profit for anybody.

A few years ago many manufacturing firms in some lines were started on a shoestring and an abundance of promissory notes. Much of the over-capacity existing today in these same lines is partly due to the earlier ease of getting credit, although, of course, the war also had its effect. With conditions as competitive as they are, it is only fair to present-day industry that any tendency toward liberality of credit should be controlled by a careful scrutiny of the effect on the general market of bringing into being food manufacturing firms of a financially irresponsible sort.

In this respect bankers also can aid the consolidation of the present economic position of industry by refusing to give credit to promotions not economically essential to the needs of society, industry, commerce, or the world. But in defense of the bankers, however, it should also be observed that in many a case continued credit to uneconomic units is justified in order to salvage as much as possible of the credit previously granted.

Foreign Market Preferences Deserve Serious Study

MARKET expansion for food products in foreign countries can be achieved only by an adequate study of conditions and requirements where the food is being or will be consumed. This is the emphatic opinion of Professor B. H. Crocheron, Director of Agricultural Extension of the College of Agriculture of the University of California, who recently returned from the Orient, where he had good opportunity to study Chinese and Japanese food habits. A preference was noted for small containers, mainly because few can afford to buy the larger cans or packages. But a vast army of potential buyers exists, and if each one purchases even only a small package, the aggregate result is the movement of large quantities of prepared food products.

France demurs from purchasing the more expensive grades of American canned fruits, but absorbs the lower-priced grades. The Argentinian possibly would prefer to buy canned peaches in a form different from that now supplied. It is more than probable that Latin America would buy greater quantities of a product such as tomato paste if it were packed in a manner in keeping with local preferences.

Great strides were made as a result of the investigations of the United States Department of Commerce, under the able direction of Mr. Hoover, in the determination of consumer preferences in foreign countries. Much remains, however, for the industries to do in getting this information for themselves. Excellent opportunities exist for pioneer missionary work of this character in several foreign countries.

Off-Grade Goods Must Be Sold as Such

ON A PER CAPITA BASIS the huge volume of foods preserved by the canning industry is surprisingly small, although the industry has been attempting to increase the consumption of canned foods by various plans. Unfortunately, nearly every effort to stimulate sales has been accompanied by certain undesirable circumstances that have a tendency to offset the good that might have been accomplished. One of the most harmful of the detrimental effects has been the action of a rather limited group who have taken advantage of the condition of "forced draft" to unload a large quantity of substandard goods. The harm done lies in an indefensible fooling of the public. The public will always be disappointed by substandard goods if it has been led to expect a decidedly palatable food and receives for its money a food which, although perfectly wholesome, is lacking in those pleasing qualities that entitle them to favorable consideration by the average American family.

Any factory may have an occasional run of off-quality goods, but rarely does it do so with malicious intent. The overwhelming majority produce them only accidentally, selling them at a price concession for exactly what they are—substandards. Many of these same canners have been astounded to see them labeled with the buyer's third-, second-, and, in rare instances, first-quality labels. Such an unscrupulous practice as marking off-grade foods with a label that implies a better quality is bound to make enemies of canned-food consumers. Therefore the canners, through their national association, have sought to have the Food and Drugs Act amended so that this harmful practice may be stopped. The proposed amendment provides that all off-quality goods carry a distinguishing mark, so that the retail purchaser may know that the goods so branded are not masquerading under false pretences—that, although wholesome food is being purchased, its palatability is not to be compared with that of a higher-priced article. The buyer need never be disappointed.

No hearings have been reported on the bill, but little opposition will probably be forthcoming from responsible sources. When passed, the measure will indicate that a constructive move has been made toward a more successful merchandising policy on a nation-wide scale.

It Is to Laugh, or Weep!

SIMULTANEOUSLY with the news that raw sugar is selling below two cents a pound in New York for the first time since 1925 comes word from Washington that the Department of Justice is proceeding against the Great Western Sugar Company in the federal court at Lincoln, Neb. The suit, under the Sherman Anti-Trust Law, is brought for alleged restraint of trade in sugar beets and beet sugar in Colorado, Wyoming, and Nebraska.

With a 50 per cent over-capacity of the sugar-refining industry of the country; with new low-cost mills starting in the South that will produce not only sugar but bagasse for wallboard and paper manufacture; with Cuba engaging in one of the greatest uncontrolled sugar campaigns in its history, presaging an indicated production of 25 per cent over last year—in the face of all this the legal action charges that the Great Western Company has hindered the building of competitive plants in a territory in which it makes and sells more than 80 per cent of the sugar used there.

Whatever may have been the intent of the Sherman Act, the effect it seems to produce is that of practically compelling the violation of the natural economic law governing overproduction in order to avoid violating a man-made law having to do with restraint of trade.

The Interpreter of Statistics May Follow Many Paths

AS AN INSTANCE of how various are the interpretations that may fairly be given to statistical data of a more or less basic sort, it is only necessary to refer to the charts of prices shown graphically in the January issue of *Food Industries*. There, on page 177, appeared a combined average price in cents per pound of hogs, prime steers, and western lambs at Chicago on the first day of the month. Giving the several bars their numerical values, the figures for the first six months of 1928 are approximately 37, 40, 39, 38¼, 40¼, and 39½, the authority therefor being one of the leading business indexes published in Chicago, and based, no doubt, on data furnished by the U. S. Bureau of Agricultural Economics.

To those economically minded, generalized data of a composite sort are ordinarily more enlightening than is the specific citation of single items. Thus, all grains of a nation tell a truer economic story than any one variety.

such as wheat, corn, or oats. Similarly, there is certain economic justification for the use of joint data concerning cattle, hogs, and sheep.

However, the range in weights from less than 100 lb. to more than 1,000 lb., the fact that of those slaughtered practically two-thirds are hogs, and the range in cost on the hoof (steers and lambs running about 15c., and hogs slightly more than half that amount) would seem to impair the usefulness of a composite, three-part index so constituted—despite the fact that it is sanctioned by usage.

The packers establish average prices of livestock slaughtered under federal inspection, which prices are weighted with the total live weight of the animals slaughtered. By so doing a composite figure is obtained that is as informative as it is possible for such a figure to be. On this basis, our recent chart would have shown a series ranging from 9.07c. in January to 10.58c. in June, the striking difference taking cognizance of relative weights, and numbers slaughtered, as well as prices per pound. In the future, such economic data as we may publish will be of this weighted sort.

Research Results Promise Economies in Invert-Sugar Sirup Manufacture

BEET SUGAR has suffered serious criticism, partly because of poor quality marketed by certain producers, especially during the development of the industry, and partly because of lack of knowledge as to the proper means for modifying sugar-using methods. Many housewives still believe that jams and jellies cannot be made with beet sugar as well as with cane; and some industrial food manufacturers are equally convinced that beet sugar will not serve their purposes so well; for example, in the making of invert-sugar sirups.

In this issue of *Food Industries* a carefully interpreted summary of an elaborate research which has been carried out by the technical bureau of the Biscuit and Cracker Manufacturers Association is presented. The authors of that paper explain why it is that beet sugar often does not invert as expected and how this difficulty can be eliminated by simple and inexpensive means. Using the technique described by these investigators, those who wish to make such sirups can do so with certainty of uniform results.

Incidentally, the results of this investigation may afford appreciable opportunity for economy in the purchase of sugar by those who are in a position to save the customary differential of ten to twenty cents per hundred pounds by buying beet sugar instead of the cane variety. Apparently, such change in practice can be carried out without endangering the quality or uniformity of the sirups made, provided the indicated precautions are taken in evaluating the buffer action of the non-sugars which are present. This contribution so used affords considerable possibilities for every user of sugar who has found it necessary to restrict his purchases to those grades commanding substantial price differentials above the minimum market. This does not mean that there should be indiscriminate purchasing of low-grade sugars. It implies simply that a tool is now offered by which to shape a new purchasing policy wherever careful test indicates that economies will follow—and of a real and substantial sort.

Utilization of Waste an Economic Problem

OF THE several possible forms of utilization of farm wastes, probably the one most in the public mind is the reclamation of cellulose. Technically, it has been demonstrated that paper can be made from corn husks, or stover. As far back as 1802, an American patent on a process of that sort was granted to B. Allison and J. Hawkins. Since then cellulose has been transformed into explosives, rayon, lacquers, leather substitutes, surgical dressings, celluloid and pyroxylin, to say nothing of simpler variants of paper such as wallboard and similar materials.

At present the problem seems to be one of economics and not of applied science; of handling materials and not of technology. Its use is determined by the costs of collection, preparation, and delivery at the factory. According to George M. Rommel, the cornstalks which are now burned or allowed to rot yearly in the seven principal corn-growing states in our Mid-West could furnish sufficient pulp for all the paper we use in a year; but such utilization is, unfortunately, not economic.

In the matter of straw, the farmer receives from 75 cents to $1.50 a ton, in the stack. The Straw Products Company, of St. Paul Park, Minn., was reported recently to be paying $9 a ton for straw, delivered at the plant. This considerable differential is due to the cost of the several steps between field and factory.

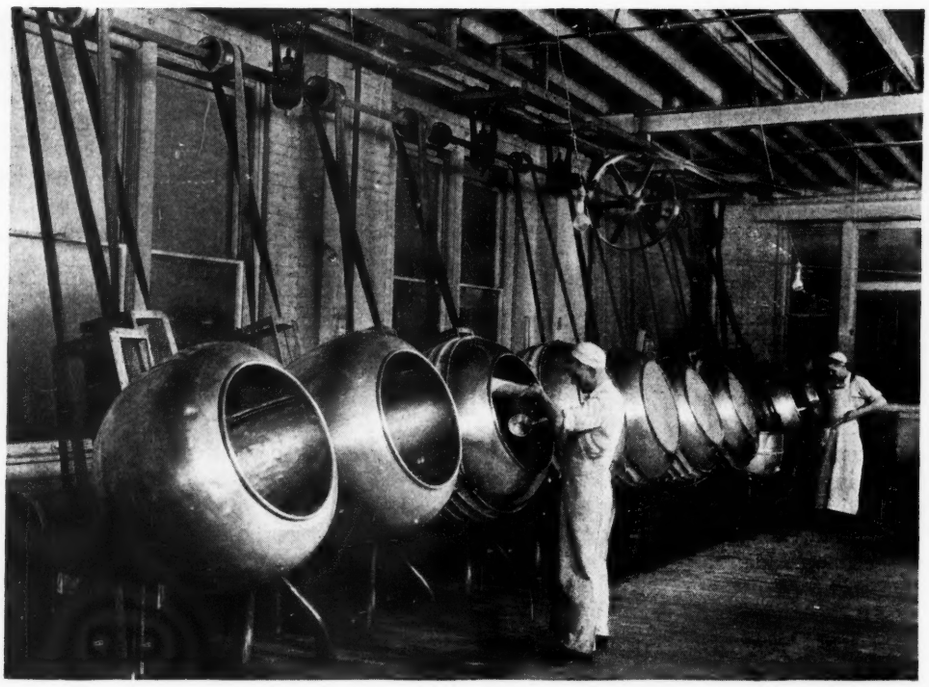
With cornstalks, a theoretical figure of $4.82 a ton for harvesting and trucking seven miles was developed in 1926 by J. B. Davidson and E. V. Collins, of Iowa State College. Experimental work done in the abnormal year 1927 by the principal cornstalk working plant in Illinois demonstrated the feasibility of a delivered price of from $5.70 to $8 a ton. This company believes that in more nearly normal years the price might be reduced to $5 or $6 without lessening the farmer's share.

Because of the inception of commercial production of magazine and book paper by this company—the Cornstalk Products Company, of Danville, Ill.—rumors have been afloat for some time to the effect that with cornstalk paper an assured fact all corn-growing farmers are straightway to receive some $12 an acre for their stover.

As an acre of cornstalks produces only four-fifths of a ton of dry substance, it is difficult to see how any such contingency is possible. Surely, paper manufacturers can pay no such prices and still compete with ordinary paper made from forest products. This new material may be an economic possibility at $6 a ton, delivered, but to render this possible the farmer cannot hope to receive more than a price based upon the going price for straw, which seems to be fairly well standardized at about $1 a ton to the farmer.

The magnitude of our annual production of this form of cellulose fairly staggers the imagination. The two states of Illinois and Iowa produce sufficient stover to furnish approximately eight million tons of material, moisture-free. Because of its high content of cellulose it is refused by farm animals; its fertility value is of undetermined and, indeed, uncertain sort.

Until something happens to lower materially the costs of collection and truckage—possibly its use as the basis of a building material in real competition with lumber—the claims of field-grown cellulose will probably remain in the realm of non-economic, and fascinating, speculation.



Rotating copper pans, in which more than 100 different kinds of centers and nuts are built up into finished products

CANDY . . . . . *A High*

By H. D. KEISER

CANDY is a food of exceptional nutritive value. Proteins, carbohydrates, fats, minerals, and vitamins—all important food constituents—are present in the ingredients of candy, which comprise sugar, milk and cream, eggs, chocolate, nuts and fruit. Attention was called forcibly to these facts by Dr. Herman N. Bundesen in his recent address at the annual convention of the National Confectioners' Association, where he also pointed out that the general public does not realize that candy is a food product. The association has since then, however, undertaken a national informative advertising campaign that should promote a better understanding of the healthful qualities of candy.

Inasmuch as candy is a food, clean and sanitary conditions are essential in its preparation. One of the most modern and best equipped plants is that of the Sweet Candy Company, at Salt Lake City. This firm, organized in 1900 and now employing a force of 350, manufactures a complete line of candy products that range from high-grade package candies to the popularly priced bulk confections. Production last year totaled 3,500,000 lb., and the ingredients used included 2,500,000 lb. of beet and cane sugar, 150,000 lb. condensed milk, 15,000 gal. dairy cream, 250,000 lb. assorted nut meats, 500,000 lb. chocolate coating, 750,000 lb. syrup and molasses, and 35,000 lb. of cocoanut.

Numerous departments are necessary in the Sweet plant, owing to the many different forms of candy that the company makes. Most of the production, however, is prepared in the hard-candy, centers, fudge and caramel, pan, and chocolate departments. Mechanical equipment, many units of which are of the automatic type, is employed extensively throughout the plant. Abundant light, both natural and artificial, is available in every department, and each is spotlessly clean.

In the hard-candy department the basic ingredients used are corn syrup and sugar. Weighed quantities of these are cooked under pressure in large copper steam kettles, coloring and flavoring ingredients being added immediately after the cooking operation. If an opaque finished product is desired, the cooked material is then "pulled," by hand or on a machine known as a puller. The pulling operation introduces air, which gives the desired opaqueness. Material for clear products is not pulled. The various color and shape effects, so characteristic of hard candies, are accomplished by the skilled candy makers in the department with the aid of ingenious machines known in the industry as plastic machines, crimpers, and continuous cutters. Throughout actual manufacturing operations, hard-candy material must be kept plastic by the application of heat, otherwise it becomes hard and brittle. For this reason much of the equipment in the department is provided with heating appliances.

To follow the various steps involved in the manufacture of a hard-candy product, such as "stuft mints," is an interesting experience. After the necessary cooking operations, the cream center, which consists of sugar, sirup, and mint flavoring, is pulled and then molded into a roll 24 in. long and 10 in. in diameter. This is covered with a jacket, or shell, formed by placing on the

Description of operations at a model plant at Salt Lake City . . . Efficient processing methods . . . Scrupulous cleanliness . . . Variety in product . . . Satisfactory industrial relations

Quality Food

roll strips of clear and opaque candy material of different colors and widths. An attractive arrangement of strips is used, and jointing is effected easily by compressing together the edges of adjoining strips. The jacket is slightly longer than the cream-center roll, and this excess length is folded over into both ends of the roll, thereby covering it completely. The jacketed roll is then placed in a plastic machine where it is rotated slowly so that its shape is retained, and heated in order to be kept workable. From one end the material is next drawn down by hand to a diameter of ½ in. or less, the rotation of the roll and a slight twisting motion imparted by the candy maker causing the stripes of the jacket to appear in the smaller-diameter material as narrow bands of alternate colors. This ½-in. end is fed into a machine known as a "cutter," which indents the plastic candy rod passing through it into a continuous chain of small identical pillow shapes. Leaving the cutter, this chain of candy forms passes on to a metal conveyor 50 ft. long, where it cools rapidly and becomes brittle. On falling into a container at the end of the conveyor, brittleness causes the individual "pillows" to separate along the indentations made by the cutter. Such is the series of operations in the manufacture of "stuft mints."

As in many manufacturing operations in other industries, the flow of material in the hard-candy department is in a straight line that conserves space and avoids unnecessary transport. The cooking kettles are at one end of the floor, and at the other the finished products drop from conveyors into bulk containers, which are emptied periodically into near-by temporary storage bins. Piping from a central fan-blowing system conveys a steady stream of cool and filtered air to a point immediately above each bin that keeps the candy at a uniform temperature. Hard candies for the stock rooms, or for immediate shipment to the trade, are packed from these bins.

Operations in the centers department might well be termed the backbone of the plant, for in this department the centers for package chocolate pieces, gum drops, jelly beans, and marshmallow goods are cooked, poured, and cast. Cooked material is charged into an automatic device called a depositing machine, which, through a row of small outlets, deposits a definite quantity of the material into a series of impressions previously made in trays filled with cornstarch by plaster of paris molds. Filling of the empty tray with cornstarch, impressing the filled tray with the plaster of paris mold, pouring the cooked material into the impressions, and separating the cooled cast centers from the cornstarch—all these operations are performed by the depositing machine. Molds of more than 300 different shapes are employed, and each depositing machine (several such machines are used in the plant) has a daily capacity of 14,000 lb. of products.

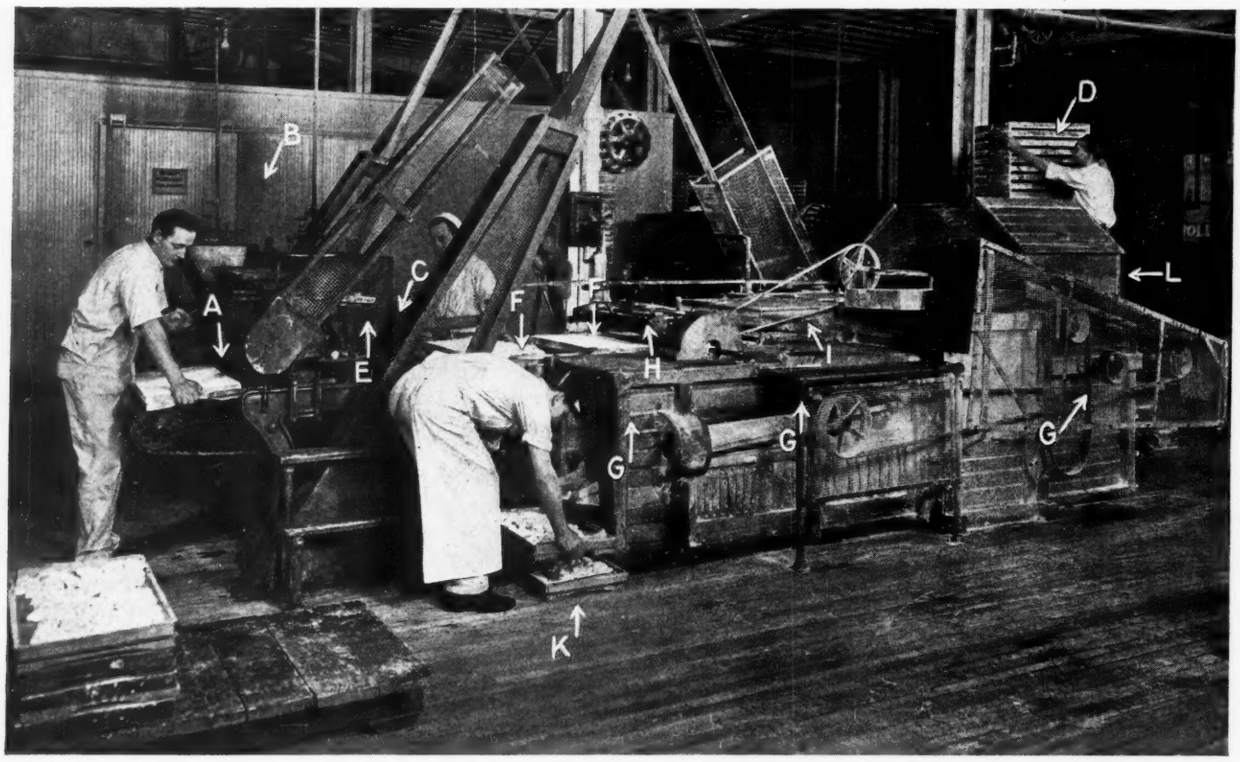
Packing hand-dipped chocolate pieces. The main unit of the Chillblast system shown in the right background provides air at a fixed temperature and humidity for the room and for the cooling tunnels to the right of the conveyors bearing the groups of dipped and cooled chocolates.

Some centers are removed from the cornstarch immediately after casting; others, such as gumdrops, are retained in the trays, which are placed for a week in heated storage rooms for curing purposes. Almost all the output of the centers department is made into finished products in other departments, except several kinds of popularly priced bulk confections, such as flat marshmallow animal and figure forms.

Dairy cream, condensed milk, sugar, cocoa, gelatin, and corn syrup are the chief ingredients used in the fudge and caramel department. After a cooked material has been made from several of these ingredients, various nut meats and fruits may be added, if certain finished candies are desired. Cooked fudge material is poured into wooden-bottomed trays, which insure slow cooling of the fudge, essential in its manufacture. Caramel material, on the contrary, should be cooled quickly, and it is therefore poured on to steel slabs that are kept cold by a circulating current of water passing through a chamber underneath the slab. When the fudge in the trays has cooled, it is cut either into 2x3 in. pieces, which are sent to the chocolate department to be coated, or into pieces $1\frac{1}{2}$ in. square, which are wrapped in the department. Caramel after cooling is cut into blocks, which are placed in the stock rooms for future use or are cut into narrow strips. These strips are then cut and wrapped on automatic caramel machines or cut into small pieces to be sent to the chocolate department, where they are used as centers for chocolate-coated caramels.

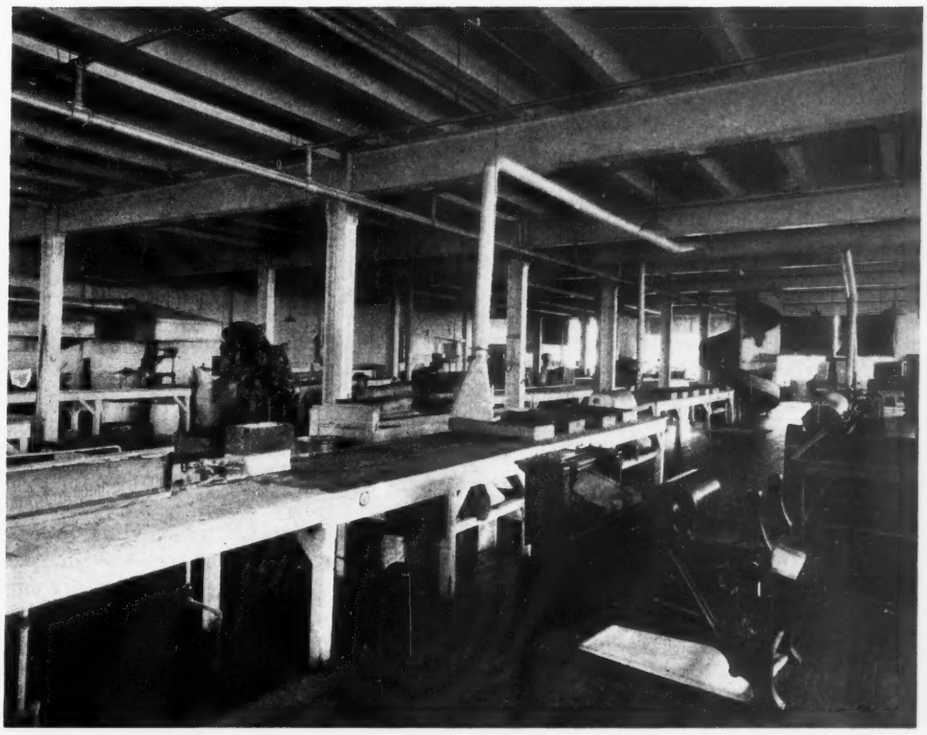
Coating, smoothing, and polishing are the principal operations performed in the pan department, where eight large open-end drums, or pans, rotated by individual motors, comprise the mechanical aids employed. All the products treated in the pans originate in other departments, but when they leave the pan department they are finished candies. More than 100 different kinds of candies are made, and the total daily capacity of the pans is 8,000 lb. Centers of jelly beans, lemon drops, Easter eggs, and of various other similarly finished products, as well as nut meats, such as almonds and peanuts, are first built up to the desired size with one or more coats in the rotating pans, the final coat being subsequently smoothed and polished. In the coating operation 100 lb. of centers or nut meats is charged into one of the pans, and 100 lb. of sugar or sirup is gradually added. The entire coated product, weighing 200 lb., is then rotated in a second clean pan with pulverized sugar; this constitutes the smoothing operation. Polishing is effected in a third clean pan by rotation with a small quantity of a special wax compound.

Chocolate coating may be done mechanically or by hand, but in both instances the composition of the coating material is identical. In hand coating, or dipping, to use the nomenclature of the industry, low-temperature liquid chocolate of a thick consistency is employed. This gives a more satisfactory but more expensive product than that obtained by mechanical means. The latter method, known as enrobing, requires that the liquid



One of the most ingenious machines used in the candy industry—the depositing machine. Centers for almost all the coated finished products are cast by this apparatus.

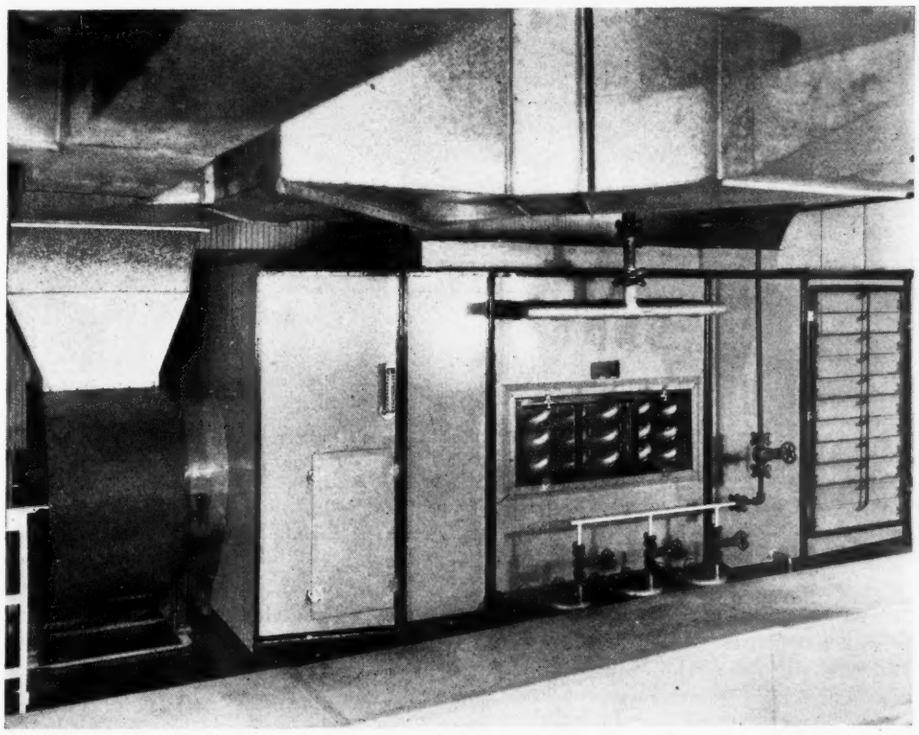
"A"—Filled trays are removed from the machine at this point, and are either fed into it again for removal of the molded centers from the cornstarch, or placed in a heated room for the curing of the centers. "B"—Heated room where filled trays are placed for the purpose of curing certain centers. After being in this room a week, the trays are fed into the machine for removal of the cured centers. "C"—A row of small outlets from the tank just to the left deposits a definite quantity of cooked center material at this point into the impressions in the trays. "D"—Empty trays being fed into the depositing machine. "E"—Tank containing cooked center material. "F"—Impressed trays passing to depositor section of machine. "G"—Centers are freed from cornstarch in this portion of the machine. "H"—Frame holding plaster of paris mold. This lowers as tray filled with cornstarch passes underneath, and compresses and impresses the cornstarch. "I"—Trays are filled with cornstarch, and the filled trays leveled off in this section. "K"—Cooled centers being ejected. "L"—Both empty trays and those containing centers to be removed from the cornstarch are fed into this end of the machine.



Where the hard candies are made. A candy maker's table, with its row of gas heaters, is seen at the extreme left. In the center is a pulling machine, and just beyond it are several plastic machines.

chocolate flow easily, and this condition can be obtained only by keeping the temperature of the chocolate comparatively high.

Liquid chocolate from mixing vats in another section of the plant is delivered to the chocolate department, where it is "tempered"—heated and agitated in kettles. After the tempering operation it is charged into the automatic enrobing machines and the containers used in the hand-dipping division of the department. Products to be coated mechanically are placed in a series of rows on a canvas belt conveyor, which discharges the products on to a moving steel-lattice segment in the line of travel, where liquid chocolate flowing through the lattice coats the bottoms of the products. They then pass on to another section of the canvas conveyor that delivers them to the enrober. Here on a second moving-lattice section a liquid chocolate coats the upper portions of the pieces, and excess chocolate is removed from them by a light air blast. Thickness of the coating is controlled by regulation of the blast pressure. Another canvas conveyor leading from the enrober carries the coated products into a covered cooling tunnel, where the coating hardens quickly. On leaving the tunnel the pieces are picked by hand from the conveyor and packed into various con-



Main unit of the Chill-blast system in the chocolate department, which cools and cleans air, besides humidifying it to the proper degree. This equipment, in brief, produces any type of atmosphere that specific needs require.

tainers and boxes. In the hand-dipping division each piece is coated separately, and then placed on a small tray, which is passed through a cooling tunnel as soon as it is filled. Trays of cooled products in groups of sixteen different varieties are placed on a packing table, where by mechanical means they pass continuously in front of ten experienced packers. Fancy boxes of high-grade chocolate candies are packed here.

Fixed temperatures and adjusted humidities, which are essential in the manufacture of chocolate-coated products, are maintained in the division of the chocolate department devoted to enrobing, hand-dipping, and packing. This is accomplished with special equipment known as the Chillblast, installed by the Bentz Engineering Corporation. This machine takes air from outside the building or from within the room, washes and cools it, and then delivers it through a fan-blowing and piping system to the room and cooling tunnels. Soot, dust, and bacteria are removed from the air, and the room atmosphere is changed every five minutes. In brief, the installation provides sanitary and healthful working conditions, besides proper air temperature and humidity control necessary in the successful manufacture of chocolate-coated products.

The Sweet Candy Company takes an active interest in the welfare of its employees. Among the numerous advantages provided for them is a well-equipped cafeteria, where lunches are served at less than cost; group insurance, which is carried entirely at the company's expense on all employees after six months' service; safety and fire-prevention equipment, installed throughout the plant; and numerous well-appointed sanitary conveniences, available in all sections of the building. Every effort has been taken, in other words, to insure the contentment of employees and the preparation of pure, wholesome products under the most modern and thoroughly sanitary conditions.

LEON SWEET

The story of the Sweet candy plant would not be complete without some reference to Mr. Leon Sweet, the president of the company. He has been a manufacturing confectioner for more than 37 years, and the present Sweet plant is a monument to his outstanding position and achievements in the industry. Besides the loyalty he inspires in the entire organization of the company, the industry, recognizing his exceptional ability, has drafted his services on numerous occasions. For two years he held the office of president of the Western Confectioners' Association; and he was a member of the executive committee of the National Confectioners' Association for a like period. To him I am indebted for the privilege of visiting the Sweet plant and preparing this article descriptive of certain portions of it. Acknowledgment is also made to numerous members of the Sweet organization who contributed the facts here presented.

Copper in Foodstuffs Proved Harmless

THE question as to whether or not the amounts of copper found in our food and drinking water have any ill effects on the human organs, causing chronic diseases, is of importance because of the widespread use of copper and its alloys in the commercial manufacture of foods. Early investigators have not been uniform in their opinions, but the weight of evidence was that copper was not a harmful substance in the amounts ordinarily to be found in food and in drinking water.

Several years ago Dr. Mallory, the eminent pathologist of the Boston City Hospital, announced that copper might be the underlying cause of cirrhosis of the liver, termed hemochromatosis. This conclusion was based upon a sudden increase in the number of autopsies showing this pathologic lesion. Practically all were of individuals who had been drinking post-war alcoholic beverages. Samples of bootleg liquors sold in Boston contained copper in larger amounts than had been suspected, and it was felt that it had been dissolved from the copper coils during distilling of the crude liquors.

In an attempt to show that the pigmentation of the liver associated with hemochromatosis was due to copper, rabbits were fed copper acetate for months. After an examination of the liver, Mallory felt justified in saying that chronic copper poisoning apparently was the causative agent of this disease in man.

This finding was so contrary to the general consensus of investigators that the Departments of Industrial Hygiene and Pathology of Columbia University jointly reopened the whole question of the effects of copper on the human system. Dr. Frederick B. Flinn, and Dr. William C. von Glahn, under the general direction of Dr. James W. Jobling, Professor of Pathology, Columbia University, and President of the American Association of Pathologists and Bacteriologists, made an investigation with scientific controls, to determine, if possible, whether feeding copper or its compounds to animals was responsible for the pigmentation of the liver. Rabbits, rats, and guinea pigs were used in their research, and definite amounts of the metal were fed, so that the exact exposure of the animal was known at all times.

The conclusions of the workers at Columbia University are to the effect that the pigment deposited in the livers of rabbitts in the experiments of Dr. Mallory was probably of exogenous origin, coming possibly from the carrots in their diet.

With these conclusions proved by the carefully controlled work of Drs. Flinn and von Glahn, the theory of Mallory that copper is the etiological agent of the human disease hemochromatosis is shown to be founded on a wrong hypothesis, for he bases his theory on observations on pigmentation in the livers of animals. This pigment has now been shown to be of endogenous origin.

As the evidence now exists, the quantities of copper that are found in food and drinking water will not injure any human organ. In fact the evidence accumulating shows that small amounts have a beneficial effect on the blood in cases of anemia.

What Is Involved in TESTING A FOOD for VITAMIN D

By E. J. QUINN
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FOR THE LAST FEW YEARS considerable attention has been paid to the vitamin value of foods. Recently, industries interested in food materials have become especially concerned with the anti-rachitic factor, or the vitamin D content, of their product. Food manufacturers frequently inquire regarding the method used for determining vitamin D. Many appear to hope that it will prove as simple as making an ordinary gravimetric analysis, and that it will be possible for some members of their chemical staff, with little or no special training or experience, to undertake such determinations. The producer of a cod-liver oil product recently inquired if it would be possible to have some one show him how to make a vitamin D test, so that he or his chemist could conduct or supervise the further work necessary.

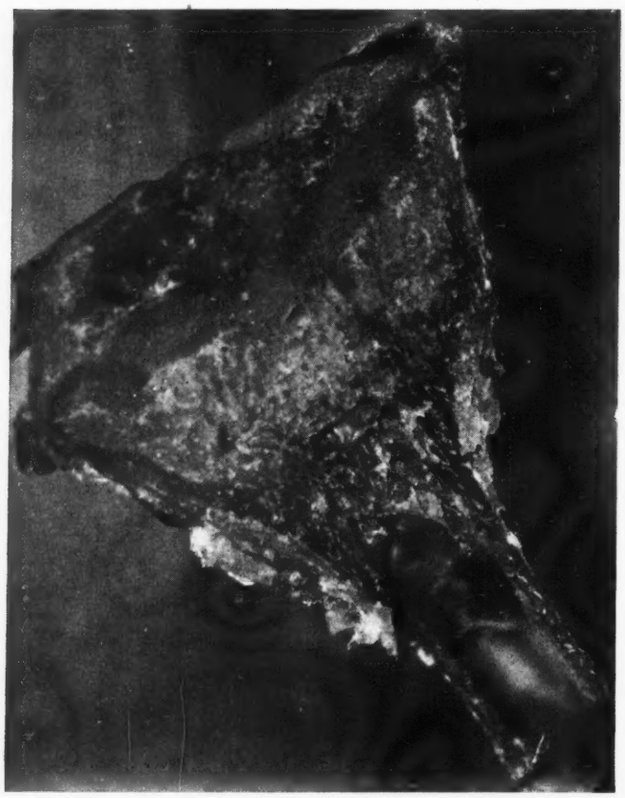
The purpose of this article is to show some of the things required in the successful testing of vitamin D and to point out certain aspects of the subject that may be found valuable to any concern contemplating work of this nature.

Some of the methods of studying the vitamin D content of foods should be discussed briefly, perhaps, in order to give an idea of the nature of the type of investigation used. Since there is no way of measuring vitamin D by direct chemical methods, the biological method of experimentation must be employed. By the use of experimental animals, which are fed prepared diets devoid of vitamin D, the effects on the animal body are studied when the deficient diet is supplemented with the food or material to be tested for its vitamin D content. Various animals may serve for these studies, but the albino rat is used most frequently.

Albino rats used in biological determinations live in individual cages mounted on racks standing in cups of oil to keep insects away

The procedure followed in these feeding experiments may be divided into two classes, depending upon the nature of the experimental diets employed. Much of the work at the present time is done where young animals of known age and weight are fed a diet that is drastically

rickets-producing, and the amount of the test food that is required to be fed to prevent, alleviate, or cure rickets is determined. In the second class are included those experiments where *diets adequate except for vitamin* D are fed, and the vitamin content of a product is determined by observing its effects on growth, or on the degree of calcification of the bones of the animal, after



Section of the tibia (magnified ten times) of an albino rat which received a rickets-producing diet only

it has received the test material as a supplement to the vitamin D-free diet over a definite period of time.

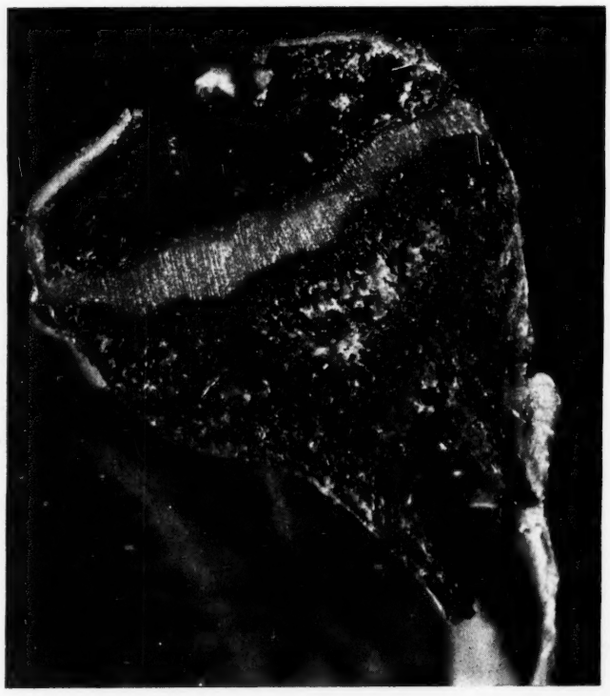
Diets that are drastically rickets-producing are not only devoid of vitamin D, but they are abnormal in their mineral content. The calcium and phosphorus relationship of these diets is such that marked deleterious changes occur in the bones of the experimental animals after they are confined to the food for a relatively short time. Upon the addition of the anti-rachitic factor, or food containing this factor, healing of the affected bones takes place; the calcium and phosphorus of the blood serum are found to increase; the pH of the intestinal contents shows a decided decrease (increase in acidity). These changes, and the extent of these changes, serve as the means of measuring the relative amount of the vitamin that is responsible for the improvements observed.

The practice in some laboratories is to have the animals that are fed the rachitic diet subjected to a series of X-ray examinations during the experimental period, and the observable effect of the test food upon calcification is thus determined. Another procedure is to feed the animals the drastic diet until they are definitely rachitic, and then for a period of several days to supplement the deficient diet with weighed portions of the food to be tested. After some days of such experimental feeding, the animal is killed, and one of the leg bones, such as the tibia or femur, is examined for newly formed calcium deposits. The examination is done either histologically or by the Shipley line test. In the latter, the bone is cut longitudinally, immersed for a few minutes in dilute silver nitrate solution, and the degree of calcification determined by viewing, with the aid of a binocular miscroscope, the black deposits of silver phosphate that mark the site of lime salts newly deposited in the bones.

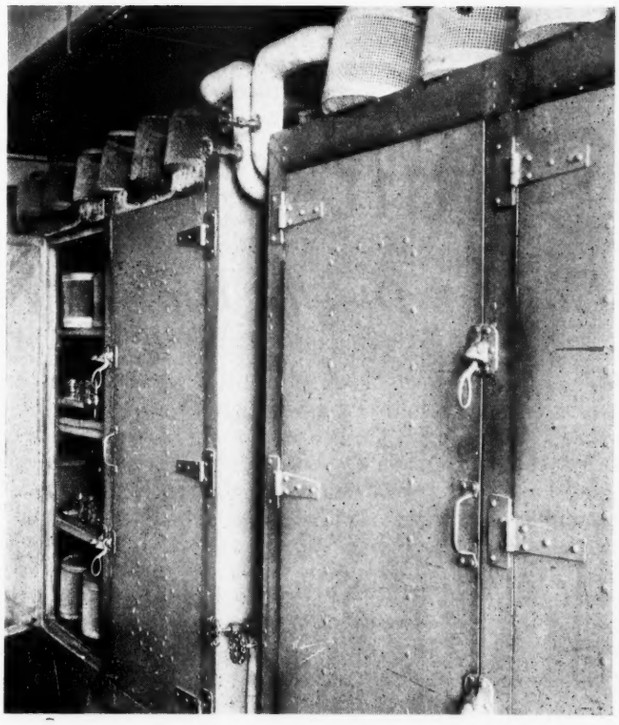
In those experiments where a diet is used that is adequate except for vitamin D, rather than the rigorous diet that is inadequate in its mineral content as well as deficient in vitamin D, the procedure is similar to the quantitative methods for the other vitamins. The basal diet (lacking only in the factor to be determined), together with weighed quantities of the test food, is fed to young albino rats during a short period of the animals' life when growth is normally rapid, and the effect on growth and calcification is studied.

The degree of calcification in these cases is found by determining the percentage of ash in the femur of the experimental animal, or the percentage of calcium in the freshly cut, or in the dry bone after alcohol-ether extraction. These experiments, in which a basal diet —adequate except for vitamin D—is used, have an advantage, perhaps, over the type of experiment in which the basal diet is still more deficient on account of its mineral relationship, because there is less danger that the ingestion of the calcium or phosphorus occurring in the test food will be a factor in effecting calcification. Especially is this true in those instances where, owing to its low vitamin D content, comparatively large amounts of the test food must be fed.

To express the relative vitamin D value of a material, determined by any of the above methods, it is customary



Section of the tibia (magnified ten times) of an albino rat which received a rickets-producing diet until the animal was definitely rachitic, the rickets-producing diet thereafter being supplemented for a short period of time by an abundance of vitamin D. This animal is a litter mate of the one represented in the preceding illustration.



Cages and utensils must be kept clean. After being washed they are sterilized and dried in these steam sterilizers.

to give the weight of the material that is found necessary to bring about certain of the effects that have been described; or to state the value of the food as a source of vitamin D by comparing it with a standard sample of irradiated ergosterol.

The importance of the need of a person well trained to conduct such tests as have been discussed should be emphasized here. Knowledge of biological chemistry and nutritional problems is absolutely essential to the person who conducts this work. Often the tests are of a highly controversial nature, and it is of the greatest importance that the person in charge of the work should know all angles of the biological method of testing. The results obtained in studies of this kind are not as definite as many of the tests made in quantitative analysis, but require proper interpretation, and, naturally, much depends upon the experience and good judgment of the investigator.

Space does not permit a detailed discussion of the use of the white rat as a test animal. For the best results it is well known that consideration must be given to the strain of animals employed. The nutritional history and the care of the stock animals determines, to a large extent, how the offspring will respond to vitamin tests, and it is quite essential that a standardized and uniform grade of animal be used to obtain results that are consistent and dependable. As sex, size, and "biological variation" of the animal are factors which affect the degree of response to a given supplement of vitamin-bearing material, care in the selection of animals and choice of controls is also required.

Proper housing and good care of the animals are important in biological work. Because the rat is sensitive to sudden changes in temperature it is imperative to control this factor, and some laboratories have rooms where a uniform temperature is provided throughout the year. Proper lighting and suitable ventilation should also be provided. The laboratory should be located where noises or confusion of any kind will not be a disturbing factor, and care should be exercised in securing assistants who are kind and considerate in the handling of the animals.

The equipment will include cages and metal racks or shelving that are constructed with their particular purposes in mind. Facilities for thorough washing, sterilizing and drying all used cages and utensils are necessary. Emphasis on the subject of cleanliness is perhaps even more important in vitamin D work than in all other types of vitamin research.

All vitamin determinations require considerable time for their completion. It may be found, in a laboratory starting out with its own breeding colony and supplying young animals for vitamin tests, that a period of four to six months' time may elapse before results of a series of tests can be reported, for the animals must be carried to a certain age before they are ready for the experimental diet. After this they may be kept on the rachitic diet, or the test-period proper, for several more weeks, and, if ash or calcium determinations are to be made, an extension of time is still needed before the actual experiment is completed. Large numbers of individual animals are often necessary to rule out the individual differences that may occur, and quite frequently considerable preliminary work of a qualitative nature is required before the quantitative tests are actually started. However, after much of the preliminary testing has been finished, and plenty of young animals become available in the breeding colony, the experiments can be so planned that new problems and new tests can be undertaken as required.

Probably no other type of laboratory work requires quite so much thought in the planning and organizing of experiments as animal work, since the material with which one works must be attended to at definite times, regardless of what else may interfere.

Dutch Colonial Tea in Britain

CONTINUED British purchases of increased amounts of tea from the Dutch islands of Java and Sumatra indicate its steadily growing popularity in England, according to the U. S. Department of Commerce.

Figures on tea importation from the Netherland East Indies given before a hearing in London on an application to indicate the origin of imported tea show that the proportion of purchases from the Netherland Indies has risen gradually since 1920 from 9 to 15 per cent of total tea imports. In the years 1920 to 1922 the average consumption of tea in the United Kingdom, excluding southern Ireland, was 405,000,000 lb., of which 90 per cent was Indian and Ceylon tea and 9 per cent Dutch.

In 1925 the total consumption of tea in the United Kingdom was 402,000,000 lb., and in the following year 409,000,000 lb. In 1927, the total consumption of tea increased to 416,000,000 lb., 82 per cent of which was imported from India and Ceylon and 15 per cent from the Netherland East Indies.

Increased consumption of Java and Sumatra tea in the United Kingdom in recent years was attributed to its cheapness and suitability for blending. During the last ten years Netherland East Indian tea has been uniformly high in quality, and, on the average, has been 5½d. per pound below the price of Indian and Ceylon tea.

Cold Packing of Small Fruits

Looms Larger in the Industry

By P. F. Nichols

Fruit Products Laboratory, University of California

FOR MANY YEARS cold storage has been one of the principal means of preserving foods. In connection with meats, fish, milk, and eggs, it is commonly used as a means of preserving the quality of the product for the entire period between production and consumption. Meats, fish, and eggs, when frozen solid, show little if any deterioration over periods of a year or longer, though they spoil rapidly when thawed and held at ordinary temperatures. When handling fruits and vegetables, the temperatures generally employed are such as to arrest or retard the respiratory and ripening processes for a relatively short period, with the purpose of extending for a few weeks the season through which the products are available for consumption in fresh condition. When removed from storage and exposed for sale, the products are permitted to recover normal atmospheric or room temperature.

The temperatures used for the storage of fruits and vegetables do not markedly affect the cellular structure, and usually they may be kept for some time at ordinary temperatures without greatly accelerated deterioration. In such respects these products differ from meats, fish, poultry, milk, and eggs, which either are cold stored at such low temperatures that the cellular tissues are physically damaged, rendering them especially susceptible to rapid spoilage, or the products are in themselves of such character that normal spoilage is rapid at ordinary temperatures.

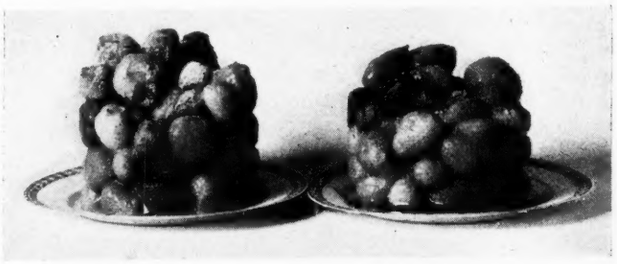
Within the last few years, there has developed, especially for the soda fountain trade, the practice of freezing fruits with or without sugar, keeping them in the frozen condition until consumed. More recently still, this practice has been extended to the storage of small fruits in frozen condition, to supply not only the soda fountain trade, but also manufacturers of pies, jams, and jellies, and even individual homes. It is claimed, and with apparent justice, that products stored in this way retain their fresh colors and flavors better than when they are canned. This industry has developed especially in the Pacific Northwest. Early attempts to store fruits—particularly loganberries—in this manner, beginning about 1920, were not entirely successful, principally because the storage temperatures used were too high, or the containers—wooden barrels for the main part—were overfilled. As a result, either the fruit fermented or it burst the barrels when it froze. Continuing interest in the problem, aided by scientific research[1,2], has so increased the knowledge of the subject that successful methods are now quite generally known.

The size to which the industry has developed, and the variety of the products handled in this way, are indicated by the following statistics covering the years 1926-27. Though figures for 1928 are not yet available, it is reported that approximately 85,000 bbl. of strawberries alone have been packed during the present season, amounting to 4,250,000 gal., slightly more than the total pack of all fruits in 1926.

Table I—Pacific Northwest Cold Pack—Total Gallons (a)

	1926	1927
Strawberries	1,658,200	2,872,350
Raspberries	1,808,400	611,650
Loganberries	234,400	117,150
Black raspberries	30,850	1,000
Blackberries	438,700	137,700
Cherries	43,500	32,150
Gooseberries	1,000	4,100
Currants	14,950	12,500
Prunes	.....	3,650
Totals	4,230,000	3,792,250

The figures in Table II, in which the pack is segregated according to the size of the containers used, indicate the pronounced tendencies toward smaller containers than the 50-gal. barrels. This tendency, it is reported, will be still more pronounced in the figures for the pack of 1928. In the latter season there has been packed a large number of 1-lb. and 2-lb. paper cartons of fruit intended for home consumption in ices, sauces, pies, and other desserts. This development has been stimulated by the widespread acceptance of home refrigerating machines in which the fruits may be kept in a frozen condition.



Strawberries in cold-packed form

Aside from the advantage claimed for this method of preservation in retaining the color and flavor of the fresh fruit, it is noteworthy that by this means large quantities of fruit may be packed rapidly, simply, and with relatively small investment for machinery and con-

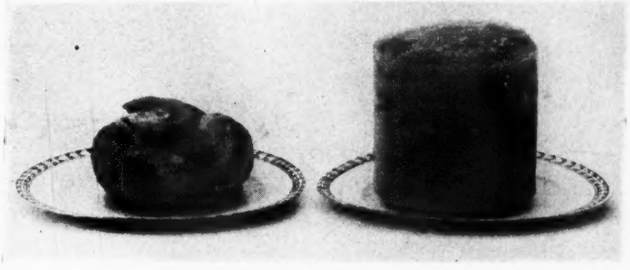
(a) From *The Western Canner and Packer*, Statistical Number, April, 1928.

tainers. This fact is of particular significance in seasons of large crops as a means of ready preservation of apparent surplus.

In late June and early July, 1928, I had the privilege of visiting cold-packing plants from Everett, Wash., to Salem, Ore. During this period the strawberry season was practically over, the raspberry season was well under way, and the loganberry and blackberry season was just beginning.

The general process consists of the following steps, some of which are omitted by some packers or in handling certain fruits: (1) washing; (2) sorting; (3) grading for size; (4) conveying to container; (5) addition of sugar; (6) closing of container; (7) transportation to cold storage; (8) storing at approximately 8 deg. F. or less for at least 48 hours; (9) storing at approximately 20 deg. F. until time of shipment in refrigerator cars.

The equipment used, as has been indicated, is simple, and direct in action. Fruit from the baskets or boxes in which it comes from the field is dumped into a hopper—which may be filled with water—from which it is conveyed over a sorting table. In its passage to the sorting table, the fruit may be sprayed with water. In sorting, leaves, hulls, and mashed, molded, or wormy fruit are removed. Following this, the fruit may be conveyed



Tomatoes and persimmon pulp

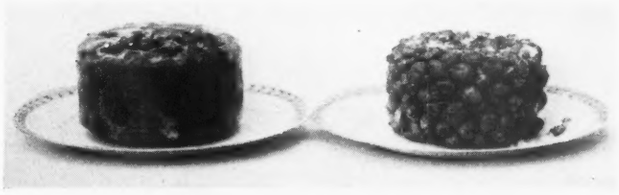
over a size grader, especially if it is being canned at the same plant. At the end of the conveyor or grader, the fruit drops directly into the container with or without the addition of weighed amounts of sugar during the filling operation.

The containers used are of three general types: the wooden barrel, usually of 50 gal. capacity, paraffined on the inside and provided with a small vent in the form of a nailhole in the head; the tin can, lacquered on the inside, and most commonly holding 30 lb. or about 4 gal.; the paraffined paper carton, holding 1 or 2 lb.

In some plants the container is mechanically agitated during filling. In others the barrels are merely rocked over a strip of 2x4 lumber nailed to the floor, or the smaller containers are shaken by hand. When the proper amounts of fruit and sugar have been placed in the container, a generous portion of the sugar is often added after all the fruit has entered the container. Then the barrel is headed, or the can or carton is covered with a slip-on lid.

Packed containers are placed in cold storage as promptly as possible after filling. As a general practice, the delay between packing and storage is a matter of only a few minutes, or an hour or two, depending upon the rate of operation and the nearness of the storage warehouse. Many plants are provided with cold-storage facilities of their own. Most of them have cold-storage warehouses in the immediate vicinity, although some are obliged to haul the packed fruit as long a distance as 50 miles to storage. Such delays are obviously undesirable, and sometimes lead to trouble, especially with fruit packed "straight"—that is, without the addition of sugar.

On reaching the cold-storage warehouse, the fruit is placed in a sharp freezer. Temperatures observed in these rooms ranged from 3 deg. to 10 deg. F. It is generally thought desirable or necessary to roll barrels, or otherwise agitate them, during the first cooling process, in order to assist in mixing and chilling the contents.



Peas, with and without brine

With the smaller containers, this is not customary. After two days or more at the low temperatures, either the fruit is removed to storage rooms at higher temperatures, or, more commonly, the temperature in the first room is permitted to rise to from 20 deg. to nearly 30 deg. F. for the prolonged storage. Some packers prefer the higher temperatures for the fruit packed straight, inasmuch as it is more readily frozen and may be kept frozen at a higher temperature than that packed with sugar. However, in fruit packed straight, it is more urgent that the fruit be brought to a low temperature promptly, in order to prevent fermentation.

Under regulations issued recently by the Secretary of Agriculture,[3] cold-packed fruit is now included under the terms of the U. S. Warehouse Act, and must be inspected and approved at the packing plants by licensed examiners. No product may be stored if it fails to reach the sharp room of the warehouse within twelve hours after inspection at the packing plant. The temperature must not exceed zero in the sharp room, where the product must remain at least 48 hours before removal to the regular storage compartments, in which the temperature must not exceed 20 deg. F.

As will be noted, it is not customary to precool the fruit before packing, but experience has shown the necessity for reducing the temperature of the product rapidly once the fruit is in the container. However, the problem does not seem to be a serious one with the small containers and practically never gives trouble with the barrels except when the fruit is packed straight, especially when there is a delay in getting the barrels into cold storage.

To avoid bursting of the barrels during freezing, it is necessary to leave ample head space in filling (usually six to eight inches) to allow for expansion in freezing. The expansion is greater in the preserving of fruit packed straight than when sugar is added.

In shipping, the fruit is placed in refrigerator cars. Some packers service all cars with ice and salt; others do not ice at all, especially if the shipment consists of barrels. Even in warm weather, barrels shipped without icing the cars from the Pacific to the Atlantic Coast remain cold, and some fruit will be found frozen on arrival. However, it is unquestionably safer to ice the cars.

Though the cold packing process is essentially the same for all products, the methods differ in some details for different fruits, or different packers. Of the fruits han-

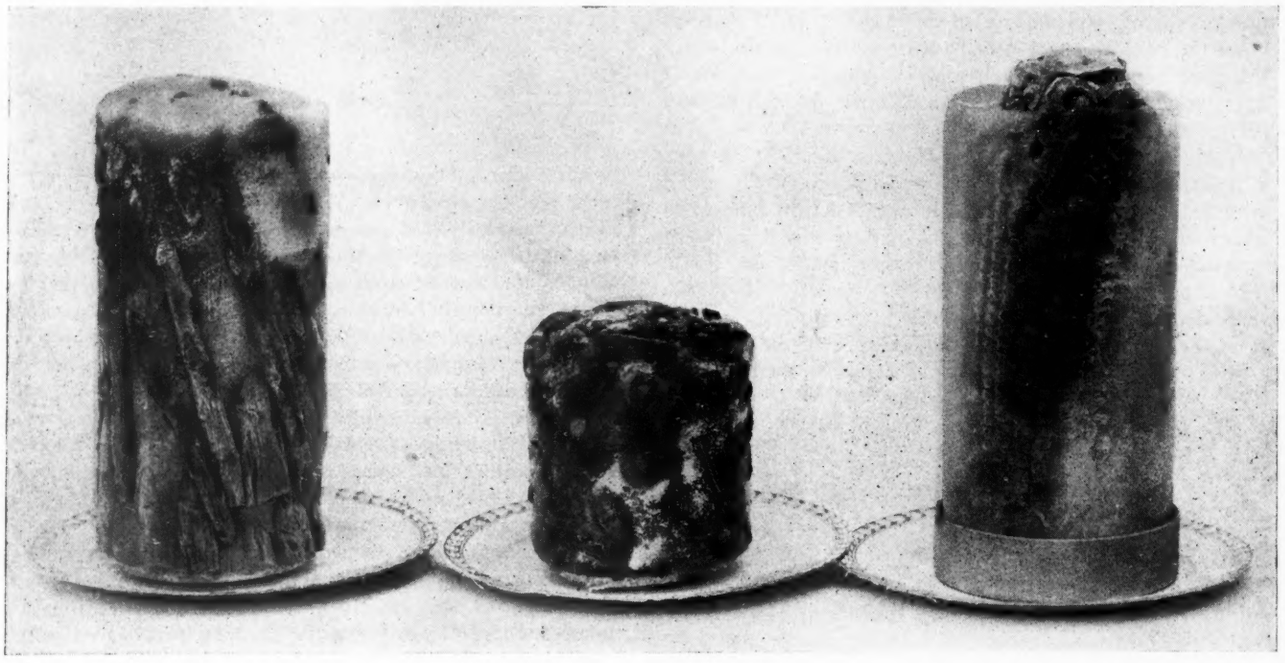
dled, strawberries, red raspberries, loganberries, and blackberries are of principal importance, and only the methods used for these will be described more fully.

Strawberries — For cold packing, strawberries are almost universally hulled by the pickers in the field. The usual price paid the grower for this service is 1c. per pound. Hulling can apparently be done most cheaply in this way, as it saves one handling of the fruit. As it increases the return to the grower, and reduces the packer's requirement for space and labor, the arrangement seems entirely satisfactory to both parties. However, the carrying quality of the fruit is not considered as good as when the hulls are left on the berries, and, with the somewhat more rigid culling and grading practiced for canning, it is generally felt that better results are obtained by hulling at the cannery.

When received from the field, strawberries are invariably sandy or dirty, and washing is always required. As has been indicated in the foregoing, this is usually accomplished by dumping the fruit from the picking baskets into a vat of water, from which the fruit is conveyed under water sprays to the sorting belt. Unless canning is also being done at the plant, the fruit, after sorting to remove culls, is not graded for size, but is run directly into the container for cold packing.

As the fruit falls into the mechanically or hand agitated container, cane sugar is added, either by scoop from a weighed supply or by means of a regulated, continuous flow from a spout. It was formerly customary to add sugar in weight equal to that of the fruit, but the tendency has been to reduce the proportion of sugar, and at present practically no fruit is packed in the proportion of one to one. The almost universal proportion in 50-gal. barrels is "two plus one," or two parts of fruit to one part of sugar, though much is packed three plus one, or with even a smaller proportion of sugar, especially in the smaller containers.

One company has patented the use of purified, crystallized corn sugar, or cerelose, and uses this material usually in the proportion of five plus one. As cerelose has less sweetening effect than cane sugar, the product seems tart in comparison. The color of the freshly packed fruit is sometimes bluish or purple rather than red, and by some this appearance is not considered desirable. On the other hand, the final color is said to be better in some instances. As the cerelose has only about half the molecular weight of cane sugar, an equal weight has about double the effect on the osmotic action of the fruit cells. Because of this fact the cerelose has the advantage that it causes the water in the fruit to escape from the cells more rapidly before freezing, and thus reduces the rupturing of cells during freezing. As a result, on thawing, the tendency of the fruit to collapse is similarly reduced. The tart flavor of the product is not objectionable to manufacturers of jams or jellies, and the low proportion of sugar used reduces the cost of shipping a given quantity of fruit.



Asparagus, string beans, and sweet corn

Red Raspberries—The necessity for washing red raspberries is not comparable to that for washing strawberries. Ordinarily, the fruit does not arrive at the plant with any appreciable adhering dirt or sand; moreover, the cup of the raspberry may carry an excessive amount of moisture through the sorting process and into the container. As a result, many packers do not wash raspberries, on the ground that it is unnecessary, carries excessive water into the pack, and tends to soften the fruit in the process of handling. On the other hand, some packers feel that washing the fruit does not soften it if it is in proper condition, and by some it is conveyed by means of sluices, in which a constant flow of water carries the fruit from step to step. In size grading, where this is done, both the perforated plate and patented wooden slat graders are used. To assist in moving and separating the fruit, water is applied plentifully during the grading process.

Unlike strawberries, which are practically never cold packed straight, raspberries are quite commonly frozen in this manner. In 1926, the amount packed straight was practically equal to that packed two plus one, and in 1927 the amount packed straight was practically double

that packed two plus one in 50-gal. barrels. However, it is not customary to pack raspberries straight in smaller containers. In packing raspberries straight in barrels, about 6 in. head space is required. This is about 1 in. more than for strawberries and 2 in. less than for loganberries. Except for the somewhat higher temperatures used for storage of straight-packed fruit, the freezing and storage of raspberries is the same as that for strawberries.

Loganberries and Blackberries — The treatment and handling of loganberries and blackberries is practically identical. As the fruit comes to the plant practically free from dirt or sand, washing is not by any means universal. Here again, many packers believe that washing is detrimental, especially when picking has been preceded by rain or foggy weather. In this event, according to the packers, the fruit is much softer and is more difficult to handle.

In certain sections of the Pacific Northwest during the last few years, some difficulty has been experienced with infestation of loganberries and blackberries by the "raspberry fruit worm," or "loganberry worm." The larva is found imbedded in the central part of the fruit. Its presence is not obvious, though it is usually accompanied by a deadened appearance of the core at the point from which it is separated from the vine. This appearance is used by experienced observers to detect the probable presence of the insects, but the only sure test is to cut the fruit open longitudinally through the core. The presence of the insect is then apparent, from its interference with the normal homogeneous white color of the core. Presence of insects above the small percentage tolerance permitted by the U. S. Food, Drug and Insecticide Administration constitutes grounds for quarantine and destruction of the pack. It is reported that some growers are spraying the vines in an attempt to eradicate or reduce this pest, but the use of poisonous sprays is likely to bring about the requirement of special washing methods for the removal of spray residue. From a study of the life history of the insect, it has been reported that the damage can be materially reduced, if not eliminated, by proper cultural practices. At present, the difficulty is not widespread, but it is receiving much attention on the part of the federal officials, and rigid inspection of the fruit is being practiced.

Loganberries and blackberries, like red raspberries, are usually packed straight, in 50-gal. barrels, but in the smaller containers sugar is usually added on a three-plus-one or four-plus-one basis. Freezing and storage practices are the same as those for red raspberries.

It will be seen that within the last three or four years

Paper containers used for cold packing

the cold packing of small fruits in the Pacific Northwest has grown from a small industry to one of major importance in food preservation. Some packers believe that in view of the difficulties associated with keeping berries, red cherries, and the like in cans by ordinary canning processes, and also having regard to the popular acceptance of cold-packed fruits, this industry is destined to displace, to a large degree, the canning of these fruits by the ordinary methods. As an example of the popular acceptance of the product, one packer reported the sale of 40 carloads of cold-packed fruits to one dealer in one order. Certainly the widespread introduction of household refrigerating machines seems to have paved the way for home consumption of small containers of cold-packed fruits. In other sections of the country which are not large producers of berries or cherries for canning, the development of the new industry does not on first consideration appear to have immediate application. However, since it is an industry by which large quantities of fruit can be preserved successfully and economically with a minimum of labor, equipment, and space, aside from cold-storage facilities, and since it appears somewhat cheaper than canning, it may prove to have real significance in sections with rapidly increasing production of perishable fruits which have not heretofore been cold packed, but in which the question of surplus disposal is imminent. Last season, fifteen to twenty cars of frozen apricots and peaches were packed in California, and it is expected that the pack will be considerably larger in 1929.

Table II—Pacific Northwest Cold Pack According to Size of Containers (b)

	Size of Container, Gallons	Production 1926, Gallons	Production 1927, Gallons
Strawberries	50	1,616,600	2,691,400
	30	11,550	18,240
	10	4,110	3,720
	5	25,965	42,530
	4 (30 lb.)	.....	101,608
	Total	1,658,200	2,872,350
Red raspberries	50	1,795,100	534,950
	30	2,490	3,780
	10	1,000	260
	5	4,795	21,890
	4	.....	.....
	Total	1,808,400	611,650
Loganberries	50	227,600	108,750
	30	1,380	2,340
	10	70	70
	5	4,925	4,910
	4	.....	840
	Total	234,400	117,150
Blackberries	50	415,400	89,400
	30	1,230	.....
	10	130	.....
	5	7,190	13,660
	4	.....	14,032
	Total	438,700	137,700

(b) Adapted from *The Western Canner and Packer*, Statistical Number, April, 1928, p. 32.

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Modern Flour Milling

Draws Upon the Past

By B. W. DEDRICK
Pennsylvania State College

IN THIS AGE we are wont to pride ourselves on our achievements in the fields of science, medicine, commerce, manufacture, and transportation, forgetting, perhaps, to give due credit to the past, with its stores of useful knowledge, fundamental principles, and experiences that have led to our present-day achievements.

Time in its flight makes the future the present, and the present the past. Tomorrow becomes today; today in turn, yesterday. So we have the lessons and experience of the days to draw upon, providing the means of comparing the achievements of today with those of the past; for it is only by comparison that we are able to set up standards: to know and to measure our progress. Old things, old instrumentalities, are often recalled and used in a new way to accomplish the purposes of the present. This is quite true of milling, which is, perhaps, the oldest industry in the world.

The various improvements made from time to time in the field of flour-mill processing and operation (grinding, bolting, grain cleaning, packing, elevating, conveying, power transmission) are largely responsible for the progress made in other lines of manufacture and production. Present-day milling owes its progress in great part to the utilization of old principles and sometimes to long-forgotten machines and methods.

Bolting or sifting, although it follows the first operation of grinding, finds the latest development in the newer methods of bolting a little more recent than that of the present method of grinding with rolls. I refer to what is called the sifter system of bolting. The rough, crude hand sieve, used thousands of years ago, is the embryo of all the more recent types of sieves, bolters, and bolting systems.

The most successful types of bolters are built on the principle of the hand sieve, as swung by human arms in the act of sifting—not a lateral shake, nor forward, but a gyratory motion imparted to the sieve by swinging or rotating the arms in a horizontal plane. This action is illustrated in Fig. 1, the arrows showing the direction taken. Sieves actuated by mechanical power have been used for over a century, the movement being either an end shake or a side shake by means of crank or eccentric; but the separations are not so clean and complete as that of the sieve with a gyratory motion, a method which has the effect of throwing the coarse and brittle husk or bran to the top of the agitated stream on the sieve, while the middlings and flour gravitate to the bottom, next to the sieve cloth, the finest sifting through as flour. Branny parts remain on top and are removed more easily than with the forward or side shake. The gyratory sieve has the advantage of being a gentle bolter, at the same time having great capacity within small compass. Plain cylindrical reels are gentle, but lack capacity. Hexagon reels have greater capacity, but their action is harsh, because the stock is agitated and tumbled excessively. The centrifugal reel is also rather harsh, but has considerable bolting capacity.

It was long recognized that the gyratory motion was a superior one in making separations, but the great problem was to adopt the mechanical means necessary to imitate the swinging motion of the arms. Something like sixty years ago, Carl Haggenmacher, of Budapest, overcame this difficulty and brought out the plan-sifter, with its gyratory motion (Fig. 2). The sieves were plane, or level. Short flights projecting from one side arrested and broke the circuit of the meal on the sieve imparted by the motion of the box. This forced the meal to start on another circuit from that point, a movement which continued until the meal had traveled from the head or receiving end to the end or tail of the sieve in a series of spiral loops.

In these boxes, sieves are placed in nests of five or more, one above the other, each forming a separate compartment or section, the box usually being suspended at the four corners by flexible rods or hangers, the upper ends secured to ceiling brackets or to an independent frame. These hangers allow the box to gyrate or swing in a circle, whose diameter is normally four inches.

The gyratory motion is secured by a crank pin, bolted to the center of the underside of the box bottom, fitting into a hole or well in the horizontal flywheel at the top of the vertical spindle, which, in turning, gives the box its swinging motion, because the center of the well is placed two inches from the center of the spindle. This makes the pin, or its center, travel in a circle whose diameter is four inches, giving the box its 4-in. swing, or *"throw,"* as millers call it. Some sifters have the regular crank arrangements with sieves inclined instead of flat or level.

Thus the first and oldest form of sifting device, incorporating and using the principles of the circular movement of the arms, has become the latest and best bolting machine. However, millers are accustomed to regard the sifters as the newest or latest type of bolters, forgetting perhaps that the cylindrical and later the hexagon reels, some of which are still in use, are new and modern compared to the use of the sieve, which reaches back

thousands of years. In the United States, the use of the gyratory sifter and system of bolting goes back only about 35 years.

The centrifugal or force-bolting reel is but the adaptation of the principle of the scouring machine, changed and modified so as to be suitable for bolting purposes. The cockle cylinder and the more recent disk machine work on the principle of sorting and elevating. In the latter, hundreds and thousands of little pockets are cut into the face of the disk, which revolves partly in the grain and sorts out either grain or seed, according to the size of pocket, rejecting other grain or seed. Inasmuch as the pocket is cut so as to retain the grain —for instance, wheat—it becomes the equivalent of the elevator cup or bucket and carries the grain to the top in the manner of an elevator belt onto which cups are fastened, discharging the contents into a form of spout or trough at the uppermost point of its travel.

Fig. 1 — Manner of manipulating sieve, and first apparatus for bolting, in use for thousands of years

Oliver Evans, a miller and millwright of a century ago, is credited with being the inventor of both the elevator and worm conveyor. He may not have been the originator of either, yet he was the first to adopt these principles in the construction of elevators and conveyors to lift grain or meal vertically from one floor to another or to move it horizontally from one place to another by means of the worm. The elevator and conveyor resulted in making a mill a connected and automatic machine.

Doubtless Evans had observed the pushing effect or forwarding movement of a revolving screw and thus adopted the principle in building his worm conveyors; or possibly he got his idea from a study of the principles of the Archimedes screw, which was used to lift water from a lower to a higher level, the screw being a helically wound tube placed in a more or less inclined position.

The elevator, in turn, is but the adaptation of the principle of the water-lifting wheel, used many centuries for irrigation purposes in Egypt, India, China, and other Eastern lands.

The bran-dusting machine is based on the principles of a type of reel patented in England as long ago as 1765, but it seems to have been long out of use. This reel had a cylinder covered with wire gauze. It had a central shaft on which it carried spirally arranged brushes in contact with the wire gauze. Its function, apparently, was to assist in helping to get the flour through and keep the gauze clean. Today, somewhat similar machines are used to sift flour or other material in connection with feeders and batch mixers.

Millstones in one form or other, from the crude ones of earliest times to the modern type of our day, have for thousands of years been used to grind grain, providing the only means of converting wheat or other grain into meal or flour from which to make bread. But millstones have been superseded almost entirely by steel rolls, so far as wheat flour milling is concerned. Millstones operating on wheat, being more or less rough, ground and incorporated a considerable quantity of fine bran particles with the flour, and, although they did excellent work on the nicely purified middlings, they, too, were discarded for the cylindrical rolls to crush down these middlings.

Again one sees old or obsolete machines coming back, or new machines based on the principles of those discarded—old instrumentalities again used in new ways. Two or three types of machines, called scrolls, or middlings mills, take the place of rolls on certain stock that needs a disintegrating action on the somewhat soft, flaky, and over-rolled middlings stock. These machines now work on the principle of the time-honored millstones. One or two are of the conical shape, with a truncated cone, the runner working inside a concave shell much like the old Roman mills unearthed at Pompeii, with the difference that these middlings mills are horizontal, made of steel, and usually ribbed. Other types are disks, like the ordinary millstones, but made of steel or other material. These mills are rather small, require little power, and answer the purpose if not employed on dirty or fibrous material; for, like the millstones of yore, theirs is a true grinding action which will comminute the branny material left in the middlings.

Although rolls are regarded as new types of grinders, they are, in fact, rather old. Compared with the great antiquity of the millstone, however, they are of recent origin. Even as far back as 1650, rolls were known and recommended for flour making, and, in 1710, Mortimer, in England, gave an illustrated description of a two-roller mill which had a differential motion between the pair, as

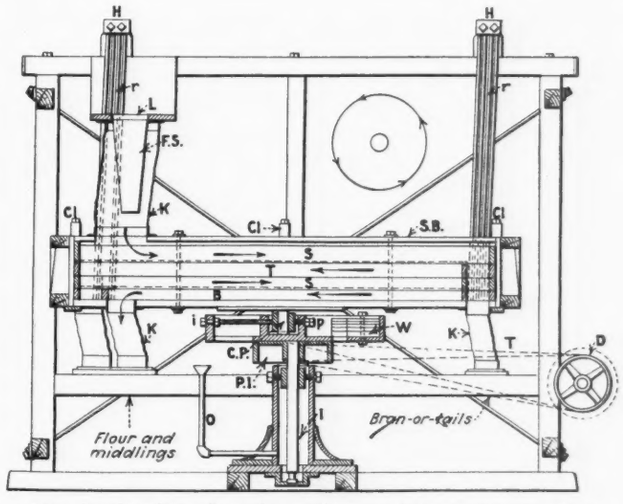


Fig. 2—Section of modern sifter or bolter, the gyratory action of which recalls the rotating hand sieve

S.B. is the sifter box and S the sieve; rr are rods or hangers that suspend the sieve, necessarily flexible to accommodate the swing; i is the spindle, P the flywheel, C.P. the crank pin fixed at the center of the box. W is weight to counterbalance weight of box; P.I., pulley; K, stocking spouts; F.S., inlet or feed spouts; L, landing board.

Since the pin cannot move outside its restricted circle of 4 in., the box will always describe a true circle like that shown by the large circle within the figure, the small circle representing the actual circle or throw, on scale relative to the size of drawing shown, the centers of C.P. and I being 2 in. apart.

is used today. Mortimer also proposed a roller working against a saddle or adjustable breast, both to be made of French buhrstone. Such a mill, made of steel, was used by a French miller, Benoist, in 1830. This type suggests the possibility of its having been derived from the old saddlestones, used for untold centuries. The saddlestone was a muller or roller—much like a rolling pin—shoved or rolled over the grain, laid upon an elongated flat stone which declined slightly from the end where knelt the person who operated the roll and used his or her weight to put pressure on the roller for crushing the grain.

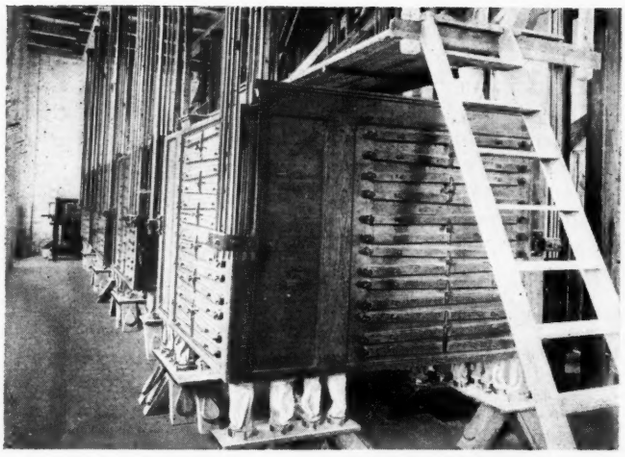


Fig. 3—Wolf sifter installed at mill of Jonathan Hale & Sons, Ionia, Mich.

The first attempts to use the roller mills, however, were not successful, and millstones continued in use until the middle of the last century, when, after later developments and improvements, rolls began to be used in European mills, particularly at Budapest. In America, rolls came into use about 1878. By 1885 they were generally accepted and rapidly displaced millstones.

This brings out some facts as to why a machine, built and based on principles apparently correct, proved a failure through inability to overcome some slight mechanical defect. The first efforts to use roller mills were more or less failures. That the principle of grinding was correct was proved in the little time they had been used, but the hooking-up and driving were defective, and not until this was overcome and the rolls were given a differential motion did they gain an established foothold and prove their superiority over millstones.

Somewhat similar was the case with the gyratory sifter. It was long known that when swung in a circular manner, as with the arms, the sieve made a much cleaner separation; but the problem of obtaining this effect mechanically seemed insurmountable until Haggemacher devised the drive, which was all that was necessary to make this type of sifter a success.

Evaporated Milk a Ready Source of Supply

By Frank E. Rice

Executive Secretary, Evaporated Milk Association, Chicago

Note—*Evaporated milk* is the term commonly used to describe milk that is hermetically sealed in tins and sterilized by heat. It contains less than half as much water as does the original raw milk from which it is prepared. *Condensed milk* is concentrated to about the same degree, but depends upon added sugar for its preservation. *Dry milk* contains only a trace of moisture; the other forms of milk are liquid.

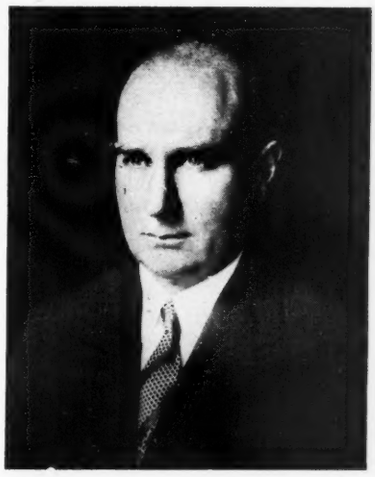
"IF IT'S IN A CAN, IT'S FRESH," is a statement frequently made in referring to canned foods. The implication here is self-evident: that the freshest of foods are used by the canner; that they are put into the can soon after leaving the farm; that the sterilization process destroys bacteria or enzymes capable of effecting changes; that the food then reaches the consumer in its original condition. On the other hand, the statement also implies that frequently raw food does not reach the consumer before some change has taken place.

In reference to milk this describes the usual state of affairs. No food product is more thoroughly permeated with bacteria at the time of production, and no food is a better medium for bacterial growth. The transportation of milk from the farm to the city kitchen requires more time and considerably more handling than does its delivery to the evaporated-milk plant, which is located in the community near the source of supply. It is then but a matter of a few hours before the milk is put through the evaporation process and transformed into a form of milk that cannot change.

Milk to be accepted at the evaporated-milk plant must be clean, whole milk. The farmers' dairies are inspected for sanitary condition, and the milk as it arrives at the plant is tested chemically, bacteriologically, and for odor and flavor; furthermore, the temperature is watched, because the producer is required to keep his milk cold until it is delivered. From the receiving room at the plant the milk passes to the "hot wells" in which it is heated rapidly. It is then drawn into the vacuum pans, where about 60 per cent of the water is removed by evaporation at a low temperature. This concentrated milk is then "homogenized"; that is, it is pumped through very minute apertures, causing the fat globules to be subdivided until they approximate collodial dimensions. They will now remain dispersed throughout the milk uninfluenced by gravity; the fat of evaporated milk does not come to the top to form cream. This is, indeed, the purpose of the homogenization process. There is more than twice as much fat in evaporated milk as in

ordinary milk, yet it does not produce an unsightly cream line. Filling into cans, sealing hermetically, and sterilizing are the next steps. The product will then keep indefinitely on the grocer's shelf or on the pantry shelf —a convenient and economical supply of "fresh" milk.

For no reason at all there has long been a prejudice against canned foods, a feeling that when raw food is put through the canning operation it may become less wholesome. But in this generation old prejudices can be viewed under the light of our newer knowledge of nutrition. Biological determinations have shown that only vitamin C is destroyed in the process of preparing evaporated milk. But as raw milk has never been considered an important source of this vitamin, no real importance can be attached to this fact.



Frank E. Rice

Some years ago a statement was published, based upon insufficient experimentation, to the effect that in evaporated milk the minerals are not as readily assimilable as they are in raw milk. Unfortunately this statement has been widely circulated. That this is not the true state of affairs has been shown by Willard and Blunt (*Jour. Biol. Chem.* LXXV, 251) and by Kramer, Latzke and Shaw (*Jour. Biol. Chem.* LXXIX, 283). Their experiments have demonstrated that these most important minerals, calcium and phosphorus, are assimilated as readily from evaporated milk as from raw or pasteurized milk.

Not only has there been no important loss in nutritive value when raw milk is transformed into evaporated milk, but there has been a gain in at least two other directions, numerous observers having shown that the protein and the fat of evaporated milk are in forms more readily digested than when eaten as raw milk. Furthermore, evaporated milk can never be a carrier of disease germs—an assertion that cannot be made of all market milk.

Practically all plants operate throughout the year, but during the late spring and summer more evaporated milk is prepared than at other seasons. On this account evaporated milk production is an important factor in stabilizing the dairy industry. When raw milk production is at its peak there would be a surplus and a possible waste were it not possible to take care of the surplus by transforming it into such non-perishable foods as evaporated milk. It is of incidental interest to note that in some respects summer milk is a better milk than that produced in winter, the succulent feed and the summer tending to increase its vitamin content.

Probably most evaporated milk is consumed within eight months following its production, though it is known to keep in excellent condition for years. On the trip recently made from Germany to this country by the "Graf Zeppelin," a quantity of American-made evaporated milk was carried. The manufacturer of this milk later reported that it had been four years since a shipment of this brand of milk had been made to Germany. Under very unusual circumstances only would milk of such age be found in any market, but the fact that the buyer of provisions for the Zeppelin crew was apparently pleased with this milk is significant.

Not only is milk supplied by the evaporated-milk route a perfectly nutritious milk, but it is also an economical milk supply. Transportation with less water and without the necessity of refrigeration, and distribution from the grocery store instead of the milk wagon, are only a few of the features making for economy. A pound of evaporated milk can be purchased in practically any city in the United States for less than a quart of bottled milk, which is its equivalent.

About 4,000,000 lb. of evaporated milk are used each day in the kitchens of the United States. This might seem to be a fairly satisfactory figure, yet surveys have shown that fully half the families in our country do not use it at all. Many people are not well acquainted with evaporated milk. They do not know what it is or how it can be used to advantage in preparing nutritious foods for the family. Also there is the rather general prejudice against all food in cans, and this seems to hold particularly in the case of evaporated milk. Surveys made by the U. S. Department of Commerce have noted several definite fears, which people have recorded. Not one of these fears has any foundation in fact. Probably the best known is the old idea that after a can is opened the food must be removed from it at once, as otherwise it becomes dangerous. Greater familiarity with the nutritive value of food in cans, and particularly with milk in cans, will produce an increase in consumption.

The statement has often been made that "the milk supply of the future will be milk in cans." The consumption of evaporated milk has increased about 40 per cent in the last ten years, and a considerably extended use is expected for the future. Not only is evaporated milk more economical than bottled milk, but of all the concentrated and preserved milks more milk nutrients can be purchased for the dollar in the form of evaporated milk than in any other product.

Convenience, however, seems to be the keynote in this generation. With people living at high speed, and more and more in congested districts, things must be made convenient to be used. There is danger of inadequate meal preparation and under-nourishment under such conditions. But with good whole milk always on hand, ready for instant use, there is less likelihood that this most important single article of food, milk, will be neglected.

New Data on Fresh Fruits Available

New summary tables on the chemical composition of fresh fruits are available in Circular No. 50-C, issued gratis by the U. S. Department of Agriculture. Data on 67 kinds and varieties of fruits and 31 fruit juices are included in this compilation by Charlotte Chatfield and Laura I. McLaughlin. All reliable analyses extant were used as a basis, and specialists in fruit production and handling were consulted. It is believed that these figures more nearly represent the composition of fruits now grown and marketed in this country than any other extensive list of analyses.

The customary protein, carbohydrates, and other constituents are given in percentage of the edible portion of each fruit. Fuel value appears as calories per pound and per 100 grams. Botanical as well as common names are given for all fruits.

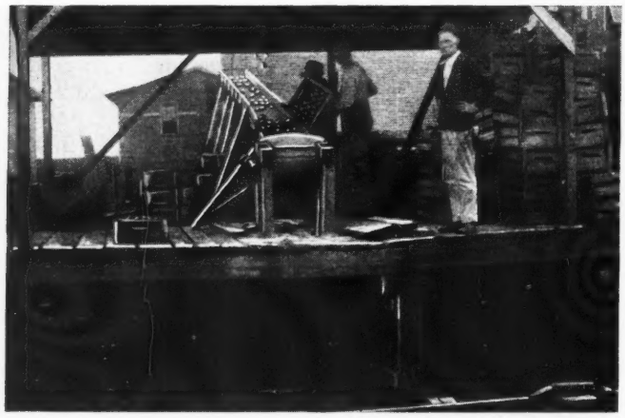
Handling Tomatoes by Water Saves Labor and Raw Materials

By C. E. RICHEY

Manager, Mound City, Illinois, Plant of Sears and Nichols Corporation

MANY of the tomatoes used at the plant of the Sears and Nichols Corporation, at Mound City, Ill., are shipped in crates and baskets, loaded in cattle cars, which are delivered on a siding that is 180 ft. from the washers where the raw material first enters the several sfeps of the operations of converting it into catsup, tomato pulp, bean sauce, or canned tomatoes.

Deliveries from local growers may be made by trucks or wagons directly to the platform on which the washers are located, but all other tomatoes are shipped in by



Tomatoes received by rail are dumped on this belt conveyor and elevated to the flume

rail, and here the materials-handling problem is the quick and easy transportation of the fruit from the cars to the washers without injury to the tomatoes, and as cheaply as possible. This has been accomplished at Mound City by washing them down a long flume by means of a stream of water. Advantage is taken of the fact that a ripe tomato will float in water.

The crates of tomatoes are first dumped on to a belt conveyor 42 ft. in length and 17 in. wide, with side rails 6 in. in height, which elevates them 6 ft. higher. Theoretically the tomatoes are dry, and a six-ply cotton belt has been in use for several years on the conveyor, but, as a part of the conveyor is exposed to the weather and also frequently becomes wet with juice if the tomatoes are over-ripe, a Balata or rubber belt would be more serviceable under these conditions. A belt-speed of 50 ft. per minute is obtained by driving the 16-in. head pulley 12 revolutions per minute by means of a 1 hp. motor through suitable speed-reducing devices.

The conveyor elevates the tomatoes to the top of the flume, as it is necessary to start at a given height in order to secure a proper slope of the flume. The flume itself is of wooden construction, of "V" shape, made from 1x12-in. material, with vertical side pieces made from 1x6-in. material. Thus the flume is 15 in. wide at the top by 15 in. deep at the center. The side pieces are required to prevent the tomatoes from flowing over the edges. Though wood has been used for its construction, metal would serve equally as well, provided it were suitably protected from rusting by paint or galvanizing.

The flume's upper end is 18 in. below the discharge end of the belt conveyor and is 10½ ft. from the ground. The length of the flume is 130 ft., with a fall of 5 ft. throughout its entire length, or 3.8 ft. per 100 ft. of travel.

Tomatoes discharge from the flume into a concrete soaking tank, 36x36 in. x 16 ft., with a 4-in. drain in the bottom and with a false bottom 15 in. from the top of the tank. The latter is made of heavy 1-in. mesh wire cloth to prevent the tomatoes going clear to the real bottom.

An elevating conveyor lifting the tomatoes from the end of the tank opposite the flume discharge is made of 30-in. Laporte belt with flights of 16-gage galvanized iron 1¼ in. high, spaced at 15-in. intervals. The speed of this conveyor is 62 ft. per minute. Its length is 10 ft. and it runs at a 45-deg. incline. The bottom of the conveyor is between the false and true bottoms of the tank, and where it passes through the false bottom a loose flexible material is used as an apron to prevent tomatoes from working downward into the lower part of the tank.

The discharged tomatoes fall into another water flume, which carries them through the wall into the rotary washers. This flume, with a roughly semicircular cross-section, 12 in. wide by 8 in. deep, is 8 ft. long and is made of galvanized iron. It makes a right-angle turn as it discharges into the washers. The water for this short flume conveyor is supplied by a 1-in. pipe from the factory supply at 40 lb. pressure and always is fresh water.

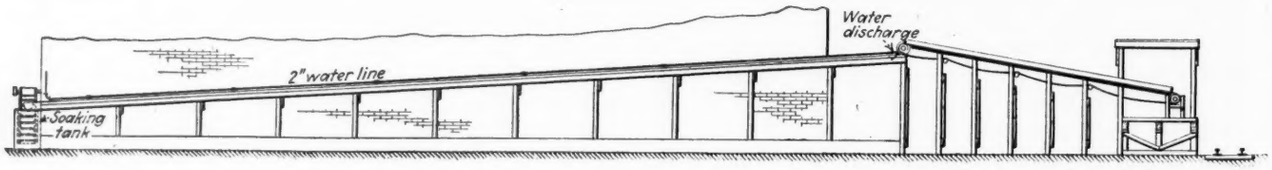
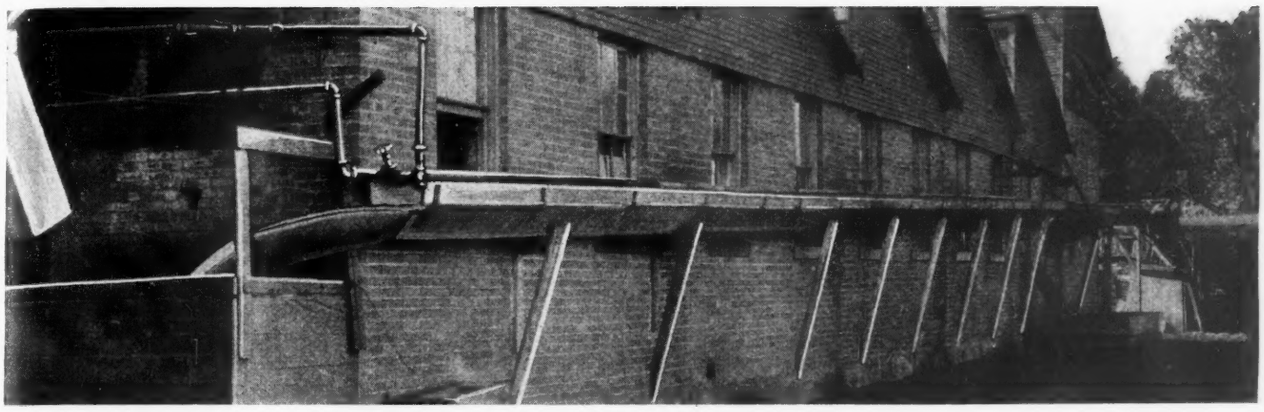


Diagram showing profile of conveyor and flume

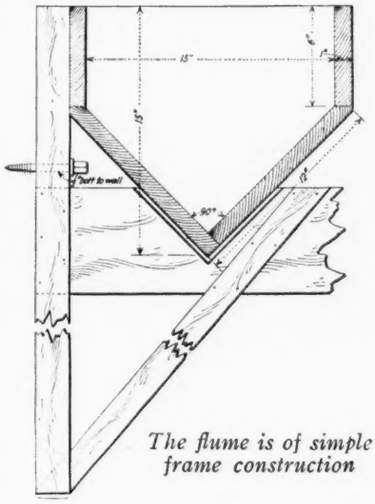


Tomatoes float and tumble in a stream of water 130 ft. long

Following the rotary spray washing, the tomatoes are discharged onto the sorting belts for inspection and trimming, and then go to the scalders.

Water Requirements for the Flume

The water for floating the tomatoes from the cars to the soaking tanks may be used repeatedly until it is deemed necessary to replace it. The condition of the tomatoes determines the frequency of its renewal. With solid, firm tomatoes one or two changes a day are sufficient, but where tomatoes are overripe and soft, or where they are muddy, it is necessary to make frequent renewals.



The flume is of simple frame construction

Normally the water is drawn from the bottom of the soaking tank by a duplex steam pump, 6x4x6 in., with a 3-in. inlet and 2-in. discharge. The water is carried in a 2-in. pipe to the head of the flume, where it is divided into two parts, and through suitable discharge nipples it is directed down the flume to float the tomatoes to the washers. The pump operates slowly, delivering between 50 and 75 gal. of water a minute.

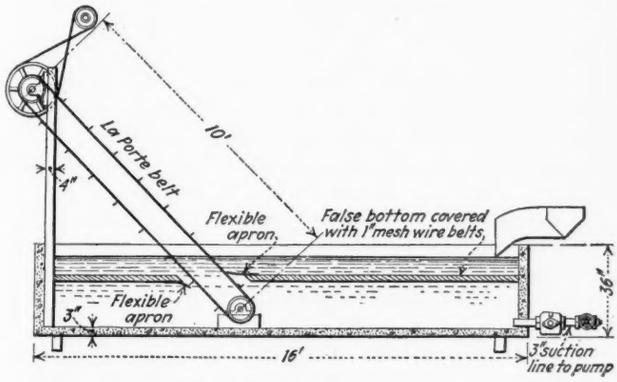


Diagram of soaking tank and elevator to rotary washer

Under the conditions described, the flume equipment has a capacity of eight tons of tomatoes an hour, but ordinarily a somewhat smaller load is imposed upon it, for the reason that the ability to sort and trim the raw stock inside the factory is normally a limiting factor.

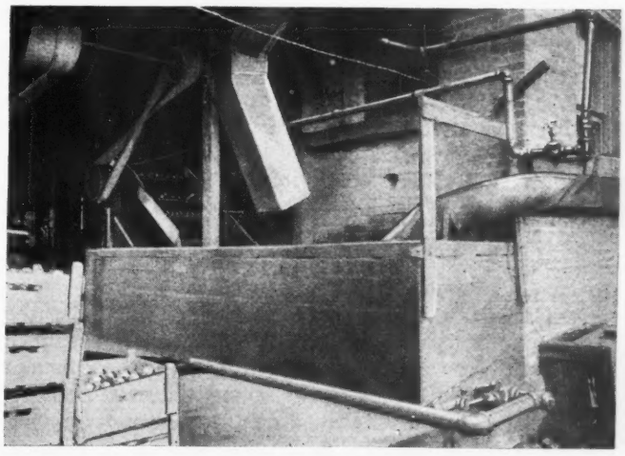
Fluming the tomatoes has several advantages over most methods of handling tomatoes at canning plants where they are received in cars. The quality of the raw material is preserved by eliminating several handlings. Every time tomatoes are handled or jolted they have a tendency to crush and break their structure, and considerable damage would occur in this way if they were trucked from the cars to the soaking tank.

Another advantage is the fact that dirt is thoroughly loosened by the long tumbling in water as the fruit rolls and floats down to the tank.

A still greater advantage is the saving of cost, as this method is much cheaper than any other system with which we are acquainted. The entire cost of trucking and the labor of three men are eliminated.

Labor Requirements

The flume system is operated by five men, four of whom are employed in carrying tomatoes in crates or baskets from the car while the other man steams the empty crates or dips them into formaldehyde solution to clean them and prevent molding. Once the tomatoes are dumped on the conveyor, they are not handled again by hand, except where their condition may require the attention of sorters and trimmers.



From the flume the tomatoes fall into the soaking tank, from which they are elevated to the rotary washers

Food Preservation in Canning

By C. O. Ball

Research Laboratories American Can Company, Maywood, Ill.

SPOILAGE in food is characterized by the presence of certain products of bacterial metabolism. Not all of these are injurious to human health; indeed some, in proper quantities, are beneficial: for example, lactic acid produced in the fermentation of vegetables, such as cabbage, or in the souring of milk.

Preservation is the process by which man strives to cause food to retain the properties it possesses at the time the preserving process begins. To do this, bacterial metabolism must be arrested. Thus, the direct purpose of every preserving process is to stop the growth of bacteria in a food for an indefinite period. Two methods of accomplishing this result are (1) to make the chemical or the physical properties of the food such that bacterial growth is inhibited; (2) to destroy the life of bacteria which would grow in the food under storage conditions to which the food will be subjected; then to prevent the access of additional bacteria to the food.

The first method is accomplished by adding to the food certain substances known as preservatives. The most common of these are sugar, salt, sodium benzoate, alcohol, and certain organic acids. Some of these preservatives, notably the acids and alcohol, may be produced within foods by fermentation or curing processes as well as by direct addition.

Heat Penetration the Essential Characteristic of Canning

The second method consists in the application of heat sufficient to destroy the bacteria and by hermetically sealing the food in containers prevent its contact with air or other contaminating substances. The development of this method is identified with that of the art of modern canning. When the method was discovered in France, during the first decade of the nineteenth century, the basic principles were entirely unknown. How far the general trend of scientific thought was from the true principles involved is shown by the following words by the eminent scientist, Gay-Lussac, in 1810: "Vegetables, or animal substances, through their contact with air, acquire immediately a disposition to putrefaction or fermentation; but in exposing them to the temperature of boiling water in vessels well closed, the absorbed oxygen produces a new combination, which is no longer able to excite fermentation or putrefaction, when it becomes concreate by heat in the same way as albumen." It was not until after the middle of the nineteenth century, when Pasteur revealed his wonderful discoveries, that the function of heat and of the hermetically sealed container in the preservation of food began to be understood.

For a food to be made commercially sterile, all pathogenic micro-organisms, and all other micro-organisms which can grow in the food at ordinary storage temperatures, must be destroyed. Perhaps the most resistant, as well as the most dangerous, pathogenic organism which may be present in canned food is *B.botulinus*. The metabolic products of this organism are extremely toxic.

One of the factors which has a most important bearing upon the ease with which bacteria can be destroyed by heat is the acidity of the medium containing the bacteria during the application of heat. Because of the influence of high acidity, fruits and other foods of similar degree of acidity can be sterilized by merely bringing them to boiling temperature (212 deg.F) in an open vessel. If they are then, while still at boiling temperature, sealed hermetically in containers, and the containers are moved about so that the hot material comes into contact with the entire inner surfaces of the containers, after which they are permitted to cool in the air, the heat from the material will destroy all bacteria present in the containers which would be capable of causing fermentation or putrefaction of the product. Any micro-organisms which are not destroyed by this treatment are unable to develop in the food, because of its acidity. Thus, the food is preserved, and is commercially sterile.

Practically All Commercial Canned Food Is Cooked in Sealed Containers

Products of lower acidity than fruits, such as vegetables and meats, would have to be heated an unreasonably long time at 212 deg. to destroy all the micro-organisms which must be eliminated in order that the products may be made commercially satisfactory. Even if such products were made sterile by boiling in an open kettle, and were then hermetically sealed at boiling temperature in containers, the heat from the product could not, without the aid of additional heat from without, sterilize the interior surfaces of the containers. Thus, commercially canned food is generally cooked in the sealed container. This includes products of the highly acid type, which were discussed in the foregoing, since the temperature of these products at the time the containers are sealed is generally not high enough to warrant the omission of the cooking, or processing, of the material after the container is sealed.

That the material at the center of a sealed container may be heated sufficiently to destroy bacteria, it is necessary to heat the package considerably longer than would be necessary merely to destroy the organisms if these and the immediately surrounding medium were maintained constantly at the processing temperature. This additional time is spoken of as time necessary to permit the heat to penetrate to the center of the food in the container. The length of this period depends upon the rate at which heat penetrates the food, which in turn depends upon the physical nature of the food and upon the size and shape of the container.

As long as 20 to 30 hours' heating at 212 deg. F. may be required to destroy the spores of some micro-organisms which cause spoilage in vegetable products. When considering this fact in reference to the sterilization of canned foods, one must add to the above period the time required for the penetration of heat into the material in a container. Evidently it is not commercially practicable successfully to process canned products of

low acidity at a temperature as low as 212 deg. F.; therefore, products of this class (vegetables, meat and seafood products) are processed at considerably higher temperatures—as high as 270 deg. F. Such processes are carried out in retorts, in which steam under pressure is the heating medium.

Scientific research is in progress continuously for the advancement of the canning industry. Much of this deals directly with the problems associated with the preservation of canned foods by sterilization. Taken collectively, the data from this research are the basis for the derivation of processes that will yield products which are commercially sterile and at the same time as nearly like the fresh products as it is possible to obtain. The success of this work is attested by constant improvement in the quality of canned foods.

Accessory Food Factors May Be Re-Named

THE science of chemistry, broad in scope and voluminous in terminology, requires that the names by which substances are known shall be chemically correct and indicative of certain class relationships between compounds. To this end there has grown up the custom of indicating the chemical structure of compounds in the first part of the name applied thereto and of showing class relationships by a similarity in the ending of the name. The rapidity with which research is moving forward makes necessary the adoption of a more suitable system of naming the known accessory food factors.

In 1913 C. Funk applied the term *vitamine* to a group of nutrient principles, then only two in number, the existence and necessity of which had been previously proved. This term, as Funk used it meant, literally, substances associated with life processes and chemically closely related to the amines, inasmuch as Funk believed them to be amine-like in structure. This theory, unfortunately for present-day terminology, has not been borne out, and it was long ago recognized, as pointed out by McCarrison,[1] that the name *vitamine* was a misnomer. In fact the abridgement of the term *vitamine* to *vitamin* was a tacit admission of its incorrectness.

The proposal of McCollum and Kennedy,[2] in 1916, that the two "vitamins" known at that time be designated by a letter and a prefix denoting characteristic solubility, was widely adopted. With the proof of the existence of other factors of similar nature this method has been extended and the "vitamins" lettered alphabetically in the order of their discovery.

Obviously, such appellations as "Fat-soluble A" and "Water-soluble C," imply nothing concerning the relationships between nutrient principles and pathological conditions. Although perhaps adequate for the period when only two or three accessory factors were known, it has become somewhat confusing with the added designation of newly discovered factors. Moreover, with the separation of one of the original factors into two component parts complications hitherto unforeseen arise.

In justice to existing terminology and the efforts of those who established it, it must be said that certain difficulties peculiar to this branch of chemistry stand in the way of following the orthodox method of naming chemical entities. Chief among these obstacles is the fact that the chemical constitution of these substances, with one possible exception, is unknown. The characteristic effects accompanying the absence of "vitamins" from the diet of man and certain animals (the syndromes of the deficiency diseases) is known, however, and based upon this fact Robert L. Jones (*Science*, Nov. 16, 1928) has evolved a system of naming which is of interest.

According to this plan the generally accepted term *vitamin* would be discarded and the name *advitant* substituted therefor in accordance with the recommendation of McCarrison. This step is believed desirable in order to eliminate the ending *amin*, which is a meaningless hangover, while retaining the term *vita* to indicate the close association of these substances with life processes. Then, in place of an alphabetical designation of the accessory food factors, each would be designated by a prefix in accordance with the disease for which it is preventive, and the suffix *amin* would be *provisionally* retained for all until such time as the chemical structure of the substance was established. With the chemical structure known, the ending *amin* could be replaced by one denoting the chemical relationship.

Accepting for the moment the recent work which indicates that "vitamin D" is irradiated ergosterol, an example will be given to show how the nomenclature herein recommended would work out. The antirachitic factor would be termed an *advitant* and provisionally designated as *rachitamin*. Granted that its identity as an activated sterol was established, the suffix *amin* would be replaced by the term *sterol*, making the permanent name *rachitasterol*.

The provisional names suggested for the vitamins now known and the relation of these names to those now in use are given below in tabular form:

Group name	Generally accepted name	Suggested provisional name	Possible permanent name
Advitant	Vitamin A or Fat-soluble A	Ophthalamin	
	Vitamin B or Water-soluble B	Polyneuramin Pellagramin	
	Vitamin C or Water-soluble C	Scorbutamin	
	Vitamin D	Rachitamin	Rachitasterol
	Vitamin E	Sterilamin	

Though realizing the limitations of the nomenclature given above, Mr. Jones believes that the names suggested not only indicate the relationship between the accessory food factors and the deficiency diseases effected in their absence, but they offer a means of stabilizing the present confusion, at the same time providing for future expansion and correction.

[1]McCarrison, Robert, "Studies in Deficiency Disease," Oxford Med. Public., 1921.
[2]E. V. McCollum and Cornelia Kennedy, "The Dietary Factors Operating in the Production of Polyneuritis," *J. Biol. Chem.*, 1926, xxiv, 491.

Food Packing in Glass

Follows New Paths

By S. Henry Ayers
Research Director, Glass Container Association

S. Henry Ayers

FORMERLY a highly specialized art, the preservation of food is fast becoming a science. Through the extensive studies of the biological and chemical changes which foods undergo, it has become possible to visualize changes which cause spoilage. Furthermore, the knowledge of the influence of acidity on the micro-organisms which cause spoilage has made possible the selection of the general type of preserving method which will be required.

Food may be preserved by various methods, among which may be mentioned salting, pickling, drying, chemical treatment, and heat. Methods for preservation by heat were discovered by Appert, working in France over a hundred years ago, and his work with products packed in glass containers led to the development of the canning industry. At that time there were many difficulties in securing the proper type of glass container and suitable seals, so that the trend in canning foods largely followed the development of the metal container.

For a long time the preservation of foods by heat was achieved by practical methods in which each packer worked out the processing temperatures and time on his own products. If the product kept, the method was satisfactory. Occasional failures with large losses could not be explained and were more or less accepted as inevitable. The splendid work of the National Canners Association through its research laboratories has done much to bring out the scientific phases of food preservation by heat and to put canning on a sound, scientific basis.

Developments in the manufacturing methods during recent years have resulted in automatic machinery which has replaced the former hand operations. This machinery assures the uniformity of size and finish so essential to cannery practice. In addition, scientific studies of glass composition, and physical and chemical properties, together with the development of precision instruments for recording and measuring temperatures in the melting tanks and annealing ovens, enable the glass manufacturer to obtain exact control of his operation. Thus today there is available glass of highly resistant qualities as regard mechanical shock and temperature changes, making possible Appert's idea of food preserved in glass.

In spite of the great development in packing in glass during the last few years, there is a general lack of realization of what can be done in this direction. In our work we are concerned largely with refinements in methods for preserving foods in glass. Though the principles involved are the same as for other containers, the methods for application of the heat have to be modified.

When packing foods, the nature of the product determines the heat treatment. For example, fruits, fruit juices, and fruit jellies can be preserved by heating to temperatures below the boiling point. Another class of products, such as vegetables, meat, and fish, must be heated to high temperatures, ranging from 240 to 250 deg. F. Fruit products, therefore, can be treated in open baths, whereas the other products must be heated in a retort under steam pressure.

In the preservation by heat of any class of food products, certain requirements have to be met. At every point in the container the products must receive heat sufficient to destroy all micro-organisms capable of growing and causing spoilage. This spoilage not only causes serious economic losses, but with some products it may result in causing food poisoning.

If all that had to be considered was the destruction of organisms by the heat, relatively few difficulties would be encountered. But the product must receive the minimum amount of heat necessary to fulfill its purpose, in order that its natural properties may be retained. Foods must not be overcooked and their texture and flavor destroyed. They must be heated in such a way that the vitamins are not affected. These considerations require a careful balance in the preservation of food by heat. With many products there is little margin between the amount of heating necessary and that which will produce undesirable effects.

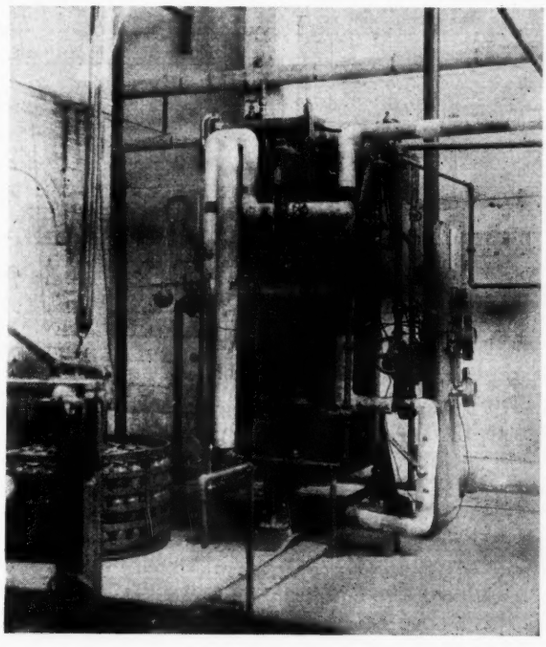
Scientific studies have established many important facts on which commercial methods of preservation have been based. As a result, spoilage problems are being rapidly overcome through the establishment of temperatures and heating periods necessary to destroy the spoilage organisms. The application of this technical information to a container holding a definite product is made possible by heat penetration curves, which tell us when the required temperature is reached.

The application of science has been extremely valuable to the packer, but a more intensive study of what may appear to be fine details must be made. As an example, mention may be made of the studies in our laboratories of the micro-organisms causing the spoilage of cider. These showed that the commercial pasteurization of cider could not be based alone on the temperatures

required to destroy the organisms obtained in laboratory tests. This was found to be due to conditions encountered in the container. Further studies showed results which indicated that, by steaming the container and seal, lower pasteurizing temperatures could be employed. This is a step in the right direction, because high temperatures produce a cooked taste.

However, this was not the end of the problem, because studies made with delicate instruments showed that in containers of larger capacities, such as ½-gal. jugs, the heating was not uniform. As a result, the liquid in the top was overheated by the time the bottom was up to temperature. Further studies of these vastly important, although seemingly minor, details have resulted in the development of methods of agitation which give a maximum heating and cooling rate. Later studies, by means of thermocouples, have shown that, by increasing the temperature of the heating medium, the rate of heating of the liquid within the containers can be greatly accelerated without overheating. These are some of the valuable points brought out by a detailed study of what appears to be a simple problem.

In the field of processing of foods which require heating to temperatures above the boiling point, science has contributed much to the development of the packing

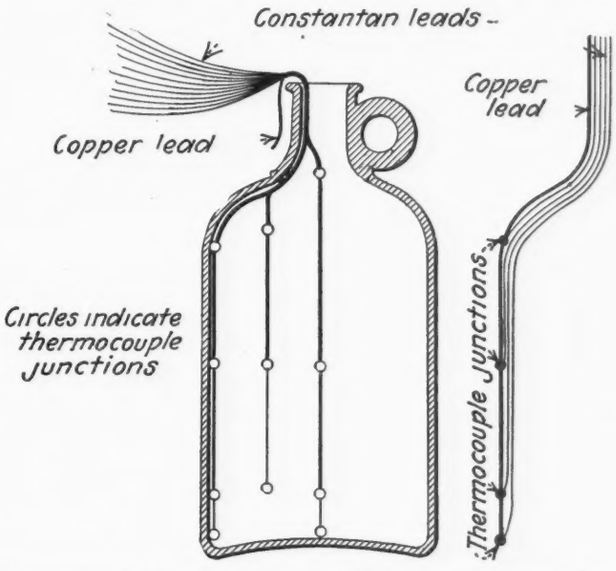


Commercial size retort equipped for experimental studies

industry. At present the methods of preservation are going through a refinement. Herein a study of seemingly unimportant points has brought forth most important results. In packing in glass containers, the same basic laws govern the process as for any other container. We are therefore concerned largely with the development of the most suitable methods for heating and cooling the containers in accordance with the heat penetration curves, which differ in some cases from other containers. Methods for processing glass containers have been in use for a number of years and are now being refined.

Once in a while the opinion is expressed that glass containers cannot stand processing at high temperatures. In this connection it will be of interest to note that in our laboratories glass containers have been processed at a temperature of 265 deg. F. for a period of one hour without the slightest effect. This is approximately 15 deg. F. higher than is given any food product.

Among other developments in the food-packing field, there is what is termed "waterless processing." Our experiments with certain vegetables packed without the usual brine and then processed have given promising results. The flavor is markedly improved, and some of



Diagrammatic sketch of thermocouple system for measuring temperatures at twelve points simultaneously within a jug

the nutritive value is prevented from being lost in the brine, which is commonly discarded.

From extensive research in food preservation it is possible to picture to the packer many of the details upon which a successful process is built. If he is to make the best use of this technical information, this composite picture must be impressed on his mind, so that he may acquire a working knowledge. Though the general aspect of the picture will not change in years to come, the details of the picture will change as new developments are made and refinements are worked out.

So it may be said that science has searched out and constructed a basic foundation upon which food preservation is becoming firmly established. It has served the packer in many ways: it has shown why certain steps were necessary; it has explained spoilage; it has brought to light improved methods and new paths to follow. Just where these will lead it is difficult to predict. But it is safe to say that they will lead to an improved quality of food products and will be of economic advantage to the packing industry.

Vanillin Imports Rise Sharply

Vanillin imports show a great increase in the last two years. According to the U. S. Department of Commerce, 1928 imports were 15,332 lb., four times those in 1927, which had far exceeded the 221 lb. purchased in 1926. More than half of the 1928 imports came from Germany, and the remainder from Canada, England, France, the Netherlands, and Switzerland. The largest amount imported during the year from any one country was in September, when 2,400 lb. arrived from Germany.

During the five-year period, 1923 to 1927 inclusive, domestic production has averaged 312,816 lb.

Standardized Inversion of Cane or Beet Sugar

Gives Best Results With pH Control

By A. A. SCHAAL and OTTO JOHNSON

Technical Bureau, The Biscuit and Cracker Manufacturers' Association, Minneapolis, Minn.

THE production of commercial invert syrup presents a number of interesting angles. One of these is the difference in the action of cane and beet sugars when used in making that type of syrup. Experience has shown that there are great variations in sugars, particularly in regard to their buffer action. This discussion will deal with the important factor of the acid requirements of sugars when used for making invert syrup.

Either cane or beet sugar may be used successfully for making invert syrup. Although commercial granulated sugars are refined to a surprisingly high degree of purity, differences of importance occasionally exist and should not be overlooked. It is not the purpose of this article to draw invidious comparisons between cane and beet sugar, but rather to point out some of the differences which should be considered when sugar is to be inverted by acid.

The manufacture of invert syrup is a simple procedure. It consists essentially of heating a solution approximately 75 per cent sugar until it reaches the boiling point. Acid is then added and the boiling continued for 30 min., after which the syrup is cooled as quickly as practicable. Where a more nearly neutral syrup is required, soda in the form of sodium bicarbonate is added when the syrup has cooled. Acids commonly used are tartaric, citric, phosphoric, and hydrochloric. However, as tartaric is usually found in food manufacturing plants, the discussion will be confined to the production of invert syrup by tartaric acid.

The inversion of sugar by an acid is often described as a catalytic reaction in which the hydrogen ion is the catalytic agent, such being a substance that increases the speed of a chemical reaction without itself entering into the reaction. Hydrogen ions are formed by the dissociation of acid materials when mixed with water, and are the active constituents of acids. Acids are often divided into two classes. Strong acids (such as sulphuric and hydrochloric) dissociate very easily, a small quantity of acid furnishing a comparatively large number of free hydrogen ions. Weak acids (tartaric, citric, acetic) do not dissociate so readily, the number of hydrogen ions in solutions of weak acids being relatively small.

The number of hydrogen ions gives the effective acidity of any material. This acidity may differ greatly from the measurement of the actual acid-reacting substances present in the material. The hydrogen ion content may be expressed as the actual number of ions present in a given quantity of material, or as the pH value. These are simply different ways of stating the same thing, and as the pH scale is commonly used in commercial practice it will be used in this discussion in referring to acidity.

A diagrammatic presentation of the pH scale, together with the pH of some common food materials, is given in Fig. 1. This shows a range of from 1 to 14. On the pH scale 7 is the neutral point. This does not signify

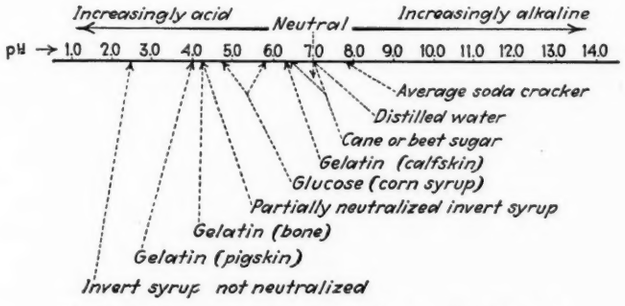


Fig. 1—Diagrammatic presentation of the pH scale

that no hydrogen ions are present at this pH, but that the hydroxyl ions, which are the alkaline ions, are exactly equal in number to the hydrogen ions present. Above the neutral point the number of hydroxyl ions (alkaline ions) is greater than the number of hydrogen ions, and all values above the neutral point are said to be alkaline. In turn, below the neutral point of pH 7, the number of hydrogen ions (acid ions) is greater than the number of hydroxyl ions, and all values in this range are acid. The degree of alkalinity increases from pH 7 to pH 14, and the degree of acidity increases from pH 7 to pH 1.

On the pH scale in Fig. 1, the divisions are of equal length. Because of this it might be thought that a solution at a pH of 5.0, for example, would be twice as acid as one at a pH of 6.0. That is not true. The pH values are derived from the actual number of hydrogen ions present in solution. Owing to the mathematical process by which the values are determined, each unit of pH represents ten times as many hydrogen ions in the same quantity of solution as one with a pH of 6.0. Thus a pH of 4.0 represents ten times the acidity of 5.0, or 100 times that of 6.0.

The inversion of sugar by acids is an instance of catalytic action, the acid being added to obtain a certain concentration of hydrogen ions. Under commercial conditions the most feasible hydrogen ion concentration for maximum inversion and highest quality of syrup was found to be a pH of about 2.5. Assuming that the condi-

tions of time, temperature, and concentration are such that a pH of 2.5 is the most desirable, the discussion will be confined to the tartaric acid requirements of commercial granulated sugars necessary to bring the resulting syrup to that pH.

Actual determinations of pH were made with a Leeds & Northrup potentiometer, using a modified quinhydrone electrode. Values were checked colorimetrically with color standards and a comparator manufactured by the LaMotte Chemical Company. The potentiometer is simply a sensitive voltmeter, which measures accurately the small electric current generated by the hydrogen electrode. In turn, the hydrogen electrode is a small electric cell or battery so arranged that the current is generated by the hydrogen ions present. The strength of the electric current generated depends on the number of hydrogen ions present in solution. By measuring the voltage generated by this cell or electrode, the concentration of hydrogen ions is easily determined.

The colorimetric method is entirely different. A large class of compounds known as indicators possess the property of changing color with variations in the number of hydrogen ions present. With the colorimetric method all that is necessary is to add a few drops of the proper indicator to the solution to be tested and compare the color with the standards. These standards can be purchased or may be prepared by adding indicator to solutions of which the pH has been determined by the potentiometer method.

The ease and quickness of the colorimetric method render it especially valuable for routine commercial work. The potentiometer method, however, is generally conceded to be the more accurate and has the additional advantage of being useful with turbid and highly colored solutions.

It should be borne in mind that if the solution ordinarily encountered in chemical processing were those of but one known acid or alkali, and that in a state of relative purity, pH values could be calculated mathematically from the ionization constants and titration values. Seldom if ever, however, is such the case. Normally such solutions are compounds containing indefinite amounts of other substances, including impurities.

Most of these extraneous materials have what is termed "buffer action," which means that relatively large quantities of acid or alkali may be added to the solution with no accompanying change in the pH value. This is due to interacting dissociations, the end products of which leave the hydrogen ion concentration unaffected. In general, the salt of any weak acid or weak base exerts buffer action, phosphates in raw sugar being an excellent example.

The 25 can and beet sugars used in the survey were purchased in the open market in various sections of the United States. Table I gives analyses of six of these sugars, which are typical of the group.

Table I—Analyses of Typical Commercial Sugars

No.	Type	Grade	Ash per Cent	Moisture per Cent	Sucrose Direct Polarization
3827	Cane	High	0.002	0.06	99.9
3881	Cane	High	0.002	0.08	99.9
3828	Cane	Low	0.006	0.12	99.7
3791	Beet	High	0.034	0.12	99.9
3825	Beet	Low	0.062	0.14	99.8
3790	Beet	Low	0.010	0.10	99.8

The grade of sugar listed in Table I does not indicate the score which the sugar is given in the trade, but is the rating given the sugar in the laboratory, based entirely on the appearance of the sugar and the color of a

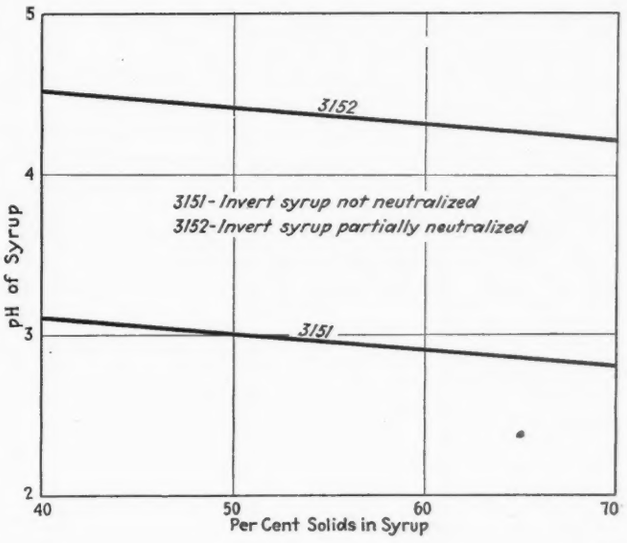


Fig. 2

50 per cent solution. No differentials in price existed on the sugars, except that customary on beet and cane sugars in general. The cane and beet sugars were first divided into the two groups. Each group was then subdivided into three further classes: high, medium, and low-grade. The color of a 50 per cent solution which was used as an index of the grade can be correlated surprisingly well with the degree of refinement of the sugar.

It was found that a solution of about 60 per cent solids was the most concentrated syrup that could be handled conveniently. In studying the effect of dilution on the pH, determinations were run on syrups of various concentrations. The results are shown in Fig. 2, in which No. 3151 represents an unneutralized syrup and No. 3152 a partially neutralized syrup. Both syrups are made from a cane sugar which ranked fairly high in buffer value. The variation would be greater if a more highly refined sugar were used; also, the error due to dilution would be less for a highly buffered sugar.

It has become trade parlance to speak of the amount of acid required for inversion in terms of ounces of acid per 100 lb. of sugar. This is a simple and easily understood way of handling this factor in the plant, and one

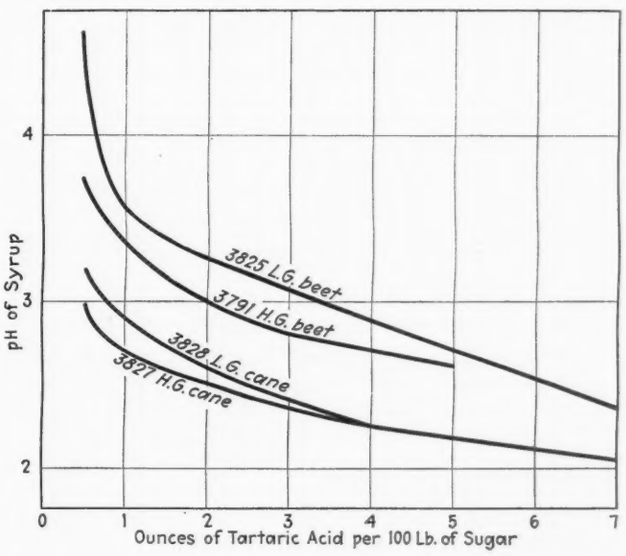


Fig. 3

which will be adopted herein with a view of making the discussion as practical as possible.

A series of curves showing the pH plotted against the amount of acid used is given in Fig. 3. Here it is clearly shown that the same amount of acid does not bring all sugars down to the same pH. This is due to their buffer action. With these sugars, buffer action is decidedly in evidence at the lower ranges of pH.

Curve No. 3827 represents a high-grade cane sugar. This shows little buffer action, and the addition of 2 oz. of tartaric acid per 100 lb. of sugar brings the hydrogen ion concentration to a pH of 2.5. Curve No. 3828 is that of a syrup made from a low-grade cane sugar. This requires 2.5 oz. of tartaric acid to give a pH of 2.5. A high-grade beet sugar such as No. 3791 exhibits much more buffer action and requires the addition of 5 oz. of tartaric acid to 100 lb. of sugar to bring

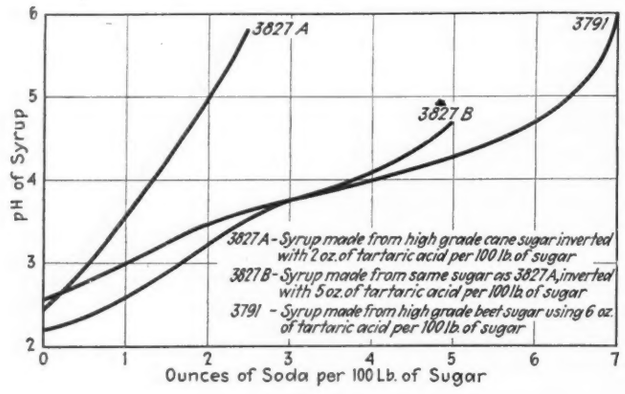

3827 A
3791
3827 B
pH of Syrup
3827 A - Syrup made from high grade cane sugar inverted with 2 oz. of tartaric acid per 100 lb. of sugar
3827 B - Syrup made from same sugar as 3827 A, inverted with 5 oz. of tartaric acid per 100 lb. of sugar
3791 - Syrup made from high grade beet sugar using 6 oz. of tartaric acid per 100 lb. of sugar
Ounces of Soda per 100 Lb. of Sugar

Fig. 4

the pH to 2.6. Curve No. 3825 represents a sugar that is even more highly buffered. In order to bring the pH to 2.5 it was found necessary to add more than 6 oz. of tartaric acid for each 100 lb. of sugar.

These sugars are representative of the normal sugars obtained on the open market. In actual practice it may be advisable to make in the laboratory 60 per cent solutions of the sugars to be used. Varying amounts of tartaric acid are added to these solutions, and the pH is determined in this manner. The amount of tartaric acid necessary to give the desired pH to a syrup made from any particular sugar is easily found.

In Table II will be found analyses of nine invert syrups made in the laboratory under carefully controlled conditions.

This table gives the amount of tartaric acid used with the pH of the resulting syrup. It brings out clearly the fact that almost any sugar can be inverted, provided the proper pH is established. There is also shown the wide divergence in the percentage of inversion when the same amount of acid is added to various sugars which differ in their buffer values.

For many purposes it is of great advantage to have an invert syrup that is less acid in reaction than the normal syrup with a pH of 2.5. For syrups of this type, soda (sodium bicarbonate) is added to the syrup after the inversion is completed. It is well known that the levulose of invert syrup is easily destroyed by the presence of alkali, and with a resultant brown color. For this reason the soda must be added carefully, not only to prevent violent foaming, but also to avoid high local concentration of the soda. It has been demonstrated that 4.3 is the highest pH that is practicable in partially neutralizing a normal invert syrup, under ordinary commercial conditions.

It may seem that raising the pH from 2.5 to 4.3 is not a sufficiently great change to be worthy of consideration. Keeping in mind, however, the fact that a pH of 2 has an active acidity 100 times greater than a pH of 4, and that a difference of two units at this range of the pH scale means considerably more than one of two units nearer neutrality, this factor is of sufficient importance to warrant neutralizing the syrup to the highest practical pH. It is not customary to neutralize above a pH of 4.3, as above this range great care must be taken to prevent discoloration of the syrup, owing to the partial destruction of the levulose.

To keep the discussion on a commercial basis, the amount of soda will be spoken of in terms of ounces of soda per 100 lb. of sugar. Fig. 4 gives the pH values of three invert syrups neutralized with various amounts of soda.

In Fig. 4, No. 3827A is an invert syrup made from a high-grade cane sugar, using 2 oz. of tartaric acid for each 100 lb. of sugar. No. 3827B is the same sugar, using 5 oz. of acid per 100 lb. of sugar. No. 3791 is a high-grade beet sugar, using 6 oz. of tartaric acid per 100 lb. of sugar.

Close examination of Fig. 4 reveals an interesting fact. It has been previously stated that 4.3 is the most practicable pH for a partially neutralized syrup. In every case the pH is close to this value where the amount of soda per 100 lb. of sugar is ½ oz. less than the amount of tartaric acid used. This may be explained also by the buffer action of the syrups. A sugar that requires more acid to bring it down to a certain pH will show the same buffer action when the pH is to be raised. Consequently, in every case where more acid must be used to bring the syrup down to the desired pH, a correspondingly greater amount of soda must be used to bring it back to a pH of 4.3.

SUMMARY

1. The following forms a good basis for making invert syrup: sugar—100 lb.; water—33 lb.; tartaric acid—2 oz. for high-grade cane sugar; 3 oz. for low-grade cane or high-grade beet sugar; 4, 5, or 6 oz. for low-grade beet sugar. The water and sugar are heated to boiling, preferably in a glass-lined, steam-jacketed kettle equipped

Table II—Analyses of Invert Syrups Made With High- and Low-Grade Sugars With Varying Amounts of Tartaric Acid

Number	3827	3827	3828	3828	3791	3791	3792	3792	3824
Kind of sugar	Cane	Cane	Cane	Cane	Beet	Beet	Beet	Beet	Beet
Grade	High	High	Low	Low	High	High	Low	Low	High
Tartaric acid in oz. per 100 lb. of sugar	½	2	2	4	2	6	5	6	2
Concentration of acid as per cent of sugar	0.031	0.125	0.125	0.250	0.125	0.375	0.125	0.375	0.125
pH before inversion	2.9	2.3	2.5	2.2	2.7	2.3	2.7	2.2	2.5
pH after inversion	2.9	2.3	2.5	2.2	2.7	2.2	2.6	2.2	2.5
Sucrose, per cent	15.8	6.0	6.5	6.5	20.5	6.3	12.2	6.5	9.5
Invert sugar, per cent	63.1	72.7	72.3	71.6	58.2	71.7	66.0	71.7	6.96
Total sugar, per cent	78.9	78.7	78.9	78.1	78.7	77.5	78.2	78.2	79.1
Inversion, per cent	79.2	92.0	91.4	91.3	73.0	91.5	83.0	91.3	87.4

with cold-water circulation in the jacket and with a stirrer to insure constant agitation. When the syrup reaches the boiling point, the acid (previously dissolved in a small quantity of water) is added and the boiling continued for 30 min. The syrup is then cooled as quickly as possible. Some means of quick cooling, such as circulating cold water in the jacket with which the kettle is begirt, is essential for the production of light-colored syrups.

2. Beet sugars are more highly buffered than cane sugars, although both can be used with satisfaction, provided the pH of the batch is controlled.

3. Inversion of the sugar does not change the pH of the syrup to any noticeable extent.

4. A rough positive correlation may be drawn between the ash content and the buffer action of a sugar in the range of pH necessary for inversion. It is not safe to judge sugars for inversion purposes solely by this criterion, however.

5. When invert syrups are to be partially neutralized, the desired pH is obtained by using ½ oz. less soda for each 100 lb. of sugar than the amount of tartaric acid used for the inversion of 100 lb. of sugar. In other words, if 4,000 lb. of sugar were inverted by 120 oz. of tartaric acid, the proper amount of soda would be 120 (the amount of acid) minus 40 times ½, which would give 100 oz., the amount of soda to produce a pH of 4.3 in the finished syrup.

Food Adulteration Fast Becoming a Lost Art

GROSS and flagrant adulteration in many food products was widely prevalent before the enactment of federal and state food control laws, said officials of the U. S. Department of Agriculture when their attention was called to a reprinted press report that had been originally published 50 years ago.

Instances of adulteration cited in the press report include the molding of chicory and of clay into the form of coffee berries colored and flavored to represent coffee; white stone ground into a fine powder and used to adulterate soda, sugar, and flour; terra alba in confectionery and cream of tartar; confectionery coloring material containing lead, mercury, arsenic, and copper; cayenne pepper adulterated with red lead; mustard with chromate of lead; curry powder with red lead; vinegar with sulphuric acid, arsenic, and corrosive sublimate; milk adulterated with water; and artificial milk, made synthetically, which did not contain one drop of the genuine article.

It cannot now be determined, say officials of the Food, Drug and Insecticide Administration, to what extent the forms of adulteration mentioned in the old press article prevailed throughout the food industry fifty years ago, but official analyses made prior to and since the enactment of the Food and Drugs Act of 1906 confirm some, if not all, of the forms of adulteration reported as being prevalent in 1879. Imitation coffee berries, made synthetically, without even a trace of real coffee, are among the official samples collected before the enactment of the food law. Artificially colored ground sawdust, used to adulterate cayenne pepper, is another exhibit retained at Washington by government officials as a demonstration of what the cupidity of some few manufacturers would lead them to do when not restrained by the fear of the penalties imposed by food control laws.

Fortunately for the consumers, and for the great majority of honest manufacturers who put out good products, most of these gross and flagrant forms of adulteration are no longer practiced, though some may occasionally occur in isolated instances. Marked improvement in the quality, wholesomeness, and truthful labeling of food products is due principally to the enactment and enforcement of federal and state pure food laws, and to the increasing realization on the part of manufacturers that it is good business to put out only sound, wholesome products, truthfully labeled.

The exposure of the revolting conditions in food factories and shops, and the flagrant forms of gross adulteration prevalent twenty years ago, when the food law was passed, made sensational news stories that were spread everywhere in glaring headlines on the front pages. Spectacular contests between food officials and manufacturers who refused to clear up their factories or abandon profitable practices also resulted in widespread publicity. As the food industries continued to alter their products and corrected their practices to comply with food control laws, as clarified by court decisions and extensive scientific investigations, there ensued a marked decrease in the news value of food control operations.

Federal and state food officials, however, continue to exercise systematic and effective supervision of the operations and the products of food factories, and their work is of as much concern as ever to the health of the consumer and to the economic welfare of the nation. Although the great majority of food concerns today put out products fully complying with all food laws—because the proprietors are honest and desire to put out good products—there is always in every industry a small minority who will take advantage of any relaxed vigilance on the part of food officials, to make a quick, illegitimate profit by adulteration. That constant vigilance by food officials is still necessary is evidenced by the fact that hundreds of seizures and prosecutions are made every year. The adulteration found today affects the pocketbook more often than the health, consisting principally of the substitution of a cheap substance for some normal ingredient that costs more. Only occasionally is the public health jeopardized by a type of adulteration that renders the product injurious to health, but these occasions require prompt action to insure the protection contemplated by food laws.

Considering the great increase in the volume of manufactured foods during the last twenty years, the proportion found adulterated today is small. Food control officials are constantly on the alert to restrain that small portion of manufacturers who will still take the chance to cheat, or to jeopardize the health of consumers, by adulterating food products, whether the adulteration results from carelessness or deliberate intent. As the result of effective enforcement of federal and state legislation, food products sold on the market today are freer from adulteration and misbranding than ever before.

Foreign Trade of the United States in 1928

By Lawrence B. Mann
U. S. Department of Commerce

THE UPSWING in United States export trade which has been under way since 1922 continued at an accelerated rate throughout 1928. This was largely the result of increased foreign demand for our manufactures and was the more notable on account of a marked decline in exports of crude foodstuffs. Imports also increased in quantity, although their value declined for the second consecutive year as a result of reduced prices of rubber, silk, and other important raw materials. The combined effect of the substantial increase in value of exports and the moderate decline in value of imports was an increase in the balance of merchandise trade to over one billion dollars for the first time since 1921. There was also a heavier net export of gold in 1928 than in any earlier year.

Exports in 1928 reached a value of $5,129,000,000, which was 5.4 per cent more than in 1927 and larger than in any other years except those from 1916 to 1920, during which conditions were abnormal and prices much inflated. The average price of export commodities showed comparatively little change during 1928, and consequently the percentage increase in quantity of exports was approximately the same as the change in their value.

Import values have been much influenced by price changes in recent years. The total value of imports in 1928 was $4,091,000,000, which was 2.2 per cent less than in 1927, and 7.7 per cent less than in 1926. If adjustments were made for price changes, however, it would appear that the quantity of imports was approximately 3 per cent larger than in 1927 and also greater than in any other previous year of our history.

Balance of Trade

The excess of merchandise exports over imports mounted from $378,000,000 in 1926 to $681,000,000 in 1927, and to $1,039,000,000 in 1928. This rapid increase in the trade balance has been attributable partly to the growth of our export trade and partly to the decline in average price of merchandise imported. Principally because of the demands of France and other countries that were stabilizing their currencies, there was a net outward movement of gold amounting to $392,000,000 in 1928, as compared with net imports in the two preceding years. The value of net exports of silver, on the other hand, decreased for the fourth successive year, amounting to about $19,000,000.

Sufficient information is not available at this time concerning "invisible" items, to explain how the large increase in our net exports of merchandise and gold was balanced. The par value of foreign loans floated in this country declined from $1,593,000,000 in 1927 to $1,428,000,000 in 1928, and there was also a further decrease in immigrants' remittances. Tourists' expenditures, however, increased by over $100,000,000, and there were marked changes in many of the other "invisible" items which enter our balance of payments.

Leading developments among the exports were large increases in shipments of finished manufactures and crude materials, and a sharp decline in exports of crude foodstuffs. Finished manufactures constituted about 45 per cent of the total trade, a larger proportion than in any earlier year except 1916.

The decline in total value of imports was the result of somewhat reduced purchases and substantially lower average prices of crude materials and manufactured foodstuffs. Imports of crude foodstuffs and finished manufactures, on the other hand, were larger than in any other year.

Exports of semi-manufactures also increased during the last year, although the relative gain was much smaller than in the case of the finished products. The gain was due to increased exports of copper and iron and steel products. Of the other leading semi-manufactures, exports of naval stores, gas and fuel oil, and coal tar products declined.

Exports of crude materials reached a value greater by $100,000,000 than the year before—a gain arising out of the higher average price of raw cotton. Cotton exports were 6½ per cent smaller in quantity than a year earlier, but their price averaged over 3.2c. a pound, or 19 per cent higher. Leaf tobacco exports were also substantially higher in value than in 1927, this having been brought about by an increase in the quantity shipped. In this group coal was the only important commodity which was exported both in smaller total quantity and at a lower average price.

A small increase, amounting to about $4,000,000, was shown by exports of manufactured foods. Exports of canned and evaporated fruits were substantially larger than in earlier years, and there were also larger exports of lard, canned fish, and dairy products. These were offset in great measure by decreases in the value of wheat flour, meats, and oilcake exported.

Changes in Exports of Principal Commodities

Expansion of our exports of finished manufactures, which has been an important feature of the trade for many decades, continued at a rapid rate during 1928. Exports of these manufactured articles reached a total value of $2,259,000,000, which was 14 per cent more than in 1927 and almost 75 per cent greater than at the ebb of post-war deflation in 1922. Automotive products accounted for about two-fifths of the total increase in this group during the last year: machinery for one-fifth, and petroleum products for one-seventh.

Crude foodstuffs were the only group of exports which declined in value during 1928, the explanation lying mainly in a decrease of 72,000,000 bushels, or 43 per cent, in the quantity of wheat exported. Rye exports were much smaller than in 1927, whereas exports of corn and barley were substantially increased.

Commodity Distribution of Import Trade

The decrease of $134,000,000 in imports of crude materials, which was the most noteworthy development in the import trade of the United States during the last year, was largely the result of lower average prices of rubber and silk, but it was accentuated by decreases in the quantity of leaf tobacco, cotton, wool, and furs imported. Rubber prices averaged for the year only 25c. a pound, as compared with 36c. in 1927 and 55c. in 1926. The total value of rubber imports was $245,000,000, less than one-half as much as in 1926, when rubber prices reached a peak. The average import value per pound for raw silk decreased from $5.27 in 1927 to $4.87 in 1928. As a result of these price declines, the total value of rubber imports dropped $95,000,000 and that of silk $22,000,000, despite an increase of about 2 per cent in the quantities of each of these commodities imported.

Imports of manufactured foodstuffs decreased in value by $45,000,000 in 1928, brought about by the lower value of sugar imports. Both the quantity and price of cane sugar imports declined, 7,717 million pounds at an average price of 2.7c., being entered in 1928, as compared with 8,431 million pounds, at an average price of 3.1c., in 1927.

The value of imports of crude foodstuffs increased by $45,000,000 in 1928. This again was due primarily to one commodity, coffee. Most of the increase in value of coffee imports was caused by an advance in the average import price from 18.4c. a pound in 1927 to 21.3c. in 1928. Cocoa imports declined in value by about $10,000,000 as the result of smaller purchases at a lower average price.

Finished manufactures showed the next largest increase in value among the economic classes of imports, the gain amounting to $29,000,000. The manufactures we are purchasing in larger quantities from foreign countries are principally those of a less highly elaborated nature, such as burlaps, newsprint, and refined oils.

Many changes in the quantity and value of imports of various semi-manufactured articles largely offset each other, so that the net increase for this entire group was only $13,000,000. Imports of fertilizers, copper, and leather were substantially greater than in 1927, whereas imports of lumber and aluminum declined. The value of tin imports fell off 14 per cent in 1928 as a result of a sharp drop in the average price. The quantity of tin imported was nearly 10 per cent larger than in 1927.

ABSTRACTS · OF · CURRENT · LITERATURE

EXAMINING FATS. *Bakers Weekly,* Vol. 61, Jan. 12, 1929, p. 75. Important tests for the examination of fats are given, and include methods for determining the soluble fatty acids, the insoluble acids in fats, the Reichert, Meissel number, Manmene's test, and the bromination determination.

* * *

SALT IN NUTRITION. A. Hadjioloff. *Journal of The American Dietetic Association,* Vol. 4, Dec. 1928, p. 149. The craving for salt is not a habit, like that for alcohol, but rather a direct response to a primary need equal to the need for water and organic nutrition. Salt is present everywhere in various body fluids and tissues in considerable amounts. A certain amount of salt is used by the body as well as excreted continually; consequently it is necessary to include salt in food in order to maintain the mineral balance.

* * *

CARBONATION AND pH. W. Thomson. *Archief voor de Suikerindustrie,* Vol. 36, pp. 1201-19, Dec., 1928. The theory and practice of pH measurement and control in carbonation processes are considered in detail. It is noted that acidity of the juice increases as the campaign progresses. Attention is called to two sudden drops in pH, one when a higher pH is applied in the second carbonation, and one resulting from sulphitation of thick sirup. In this study, no special steps were taken to increase the acidity of the cane juice.

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DISTRIBUTION OF VITAMIN E. Nina Simmonds, J. E. Becker and E. V. McCollum. *Journal of Nutrition,* Vol. 1, Sept. 1928, p. 39. It has been previously reported that wheat germ oil and certain other vegetable products are rich in vitamin E, while it is absent in lard and cod liver oil, and relatively scarce in butter fat. This work shows (1) no evidence that vitamin E has any rôle in iron assimilation; and (2) that certain samples of lard and cod liver oil promote fertility to an extent which compels the conclusion that they contain considerable amounts of vitamin E.

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SUGAR MACHINERY. Erich Gundermann. *Chemische Apparatur,* Vol. 15, pp. 125-6, 220-2, 254-7, 266-8; Vol. 16, 4-5, June 25, Oct. 10, Nov. 25, Dec. 10, 1928; Jan. 10, 1929. Research and developments in the field of sugar making apparatus and machinery are reviewed for the period 1919-1926. These developments include side and bottom discharging diffusers; a new beet juice-extracting machine; a separator for milk of lime; a concentric ring-heating unit for crystallizing pans; a refractometer device for control of pan boiling; improved centrifugals, including a semi-continuous type; and new material-handling machinery and safety devices.

* * *

CRYSTALLINE GLUCOSE FROM WOOD. *Canadian Chemistry and Metallurgy,* Vol. 13, p. 20, Jan., 1929. Report of U. S. Consul General, Frankfort-on-the-Main. A factory in Geneva, Switzerland, equipped with 18 vats each of 3.6 cu.m. contents, is now manufacturing glucose on a commercial scale by means of a process called "wood saccharization." The raw material is pulverized sawdust, which is treated with superconcentrated hydrochloric acid until transformation into glucose takes place. The acid is then separated and recovered. The sirup is dried and purified to give a final product of a light brown color. Although this new product may be used in feedstuffs, further purification of the glucose is necessary to make it available for human consumption. Patents cover various phases of the manufacturing process.

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DETERMINATION OF CARBON DIOXIDE. R. Hertwig and J. S. Hicks. *Cereal Chemistry,* Vol. 5, Nov. 1928, p. 482. The Chittick Method (*A.O.A.C. Book of Methods,* 1925, p. 305) for the gasometric determination of carbon dioxide in baking powder, self-rising flour, and other food products has omitted a corrective factor for the displacement due to the reagent used—dilute sulphuric acid. Analysis of a sample of self-rising flour, according to the Chittick method, gave values of 0.62 per cent to 0.73 per cent carbon dioxide. Applying the vapor pressure correction factor, the analysis shows 0.52 per cent carbon dioxide. Without due allowance for the correction, results for baking powder are in error in sufficient degree to require attention of users of the method.

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COMPARISON OF COD LIVER OIL AND ULTRA-VIOLET LIGHTS IN RICKETS. A. D. Holmes et al. *American Journal of the Diseases of Children,* Vol. 36, Nov. 1928, p. 952. In these tests white rats were used. It was found that a daily amount of 5 milligrams of the cod liver oil gave greater protection against rickets than 15 min. of irradiation with ultra-violet light at a distance of 36 inches. Five milligrams of the cod liver oil appeared to be as effective as larger amounts, when used as a protection against rickets. The group of experimental animals which received both ultra-violet light and cod liver oil grew slightly more than the animals which received either ultra-violet light or cod liver oil alone.

IODINE CONTENT OF CAPE COD CRANBERRIES. F. W. Morse. *Journal Biological Chemistry,* Vol. 79, Oct. 1928, p. 409. Analyses of several lots of cranberries showed that the iodine content is highest in fruit from parts of Massachusetts nearest the sea. The same characteristic is true for potatoes, cabbage, apples, and lettuce.

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VITAMIN E. J. Waddell and H. Steenbock. *Journal of Biological Chemistry,* Vol. 80, Dec., 1928, p. 431. The authors have shown that the vitamin E potency of a mixed diet containing various food materials may be completely destroyed by treatment with ferric chloride, an iron compound. The destructive action seems to be due to the presence of iron, which accelerates the oxidation of vitamin E, the anti-sterility vitamin. The iron treatment did not appreciably affect the vitamin A content.

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VERTICAL AND HORIZONTAL MIXING. *Bakers Weekly,* Vol. 61, Jan. 19, 1929, p. 55. P. G. Pirrie. The development of gluten, and mixing action, for both the vertical and horizontal mixing methods have been studied, and the results traced by means of picture graphs. As the gluten develops in each type of mixer, a greater amount of power is consumed until a maximum is reached, after which the gluten begins to break down. Charts and pictures illustrate the study made.

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IRRADIATED ERGOSTEROL. *Journal of Biological Chemistry,* Vol. 81, Jan., 1929, p. 49. A. Knudson and C. N. Moore. Antirachitic properties can be induced in various substances, such as cholesterol, yeast, and cotton-seed oil, by exposure to high voltage (180-200 kilovolts) cathode rays. The highest potency obtained by cathode ray exposure was 0.0005 mg. per day, and by ultra-violet irradiation 0.00002 mg. per day, which shows the latter product to be 25 times as potent.

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REFRIGERATOR INSULATION. J. H. Bracken. *Refrigerating Engineering* 16, 132-3, Nov., 1928. For proper insulation of refrigerating units, the outer shell must be moisture-proof to protect the insulation from contact with condensed water; or the insulation itself must be proofed. The latter alternative is preferable from the standpoint of factory convenience. Either a protective paint or like coating may be applied, or the insulation may be wrapped in a waterproof membrane. It is more important, particularly in small units, that the insulation shall be continuous than that it shall be thick. That is, a relatively thick broken layer of insula-

tion is less effective than a somewhat thinner layer uninterrupted by steel or other structural material at corners and edges. Standardization would be helpful to the manufacturer, particularly in the matter of thickness. Due regard should be given to the maintenance of a constant low temperature as well as to the initial cooling of the refrigerator.

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ACETONE AS FAT SOLVENT. B. M. Margosches, B. Krakowetz and F. Schnabel. *Chemische Umschau* 35, 300-5, Nov. 21, 1928. For works laboratories, the use of acetone as a solvent for fats and oils in the determination of iodine numbers has the advantage of allowing a rapid determination, with sufficient accuracy, at lower cost than by the usual method. The analysis is not affected by light, and can even be made in direct sunlight. It should be noted that acetone can be used as solvent only for the fat, not for the iodine. Experimental results are shown for several edible oils, animal and vegetable.

* * *

HOW STRONG IS THE STAFF OF LIFE? Dr. Walter H. Eddy. *Bakers Weekly*, Vol. 60, Dec. 15, 1928, p. 57. There is a willing tendency to accept the whole cereal in many forms as a breakfast adjunct. A decided preference for white flour foods persists in spite of all arguments as to their deficiencies. The development of milk breads is a direct response of manufacturer and consumer to advice as to white flour deficiencies. It does not follow, because a foodstuff is not in itself a complete diet, that it is thereby useless or necessarily harmful. Analyses show that graham, entire wheat, or rye breads made with water are all distinctly better sources of iron and phosphorus than white bread made with either water or milk. Tastes differ. White bread may well find a perfectly satisfactory place in a menu in which incomplete foods are properly supplemented.

* * *

CAR REFRIGERATION. George E. Hulse. *Refrigerating Engineering*, Vol. 17, pp. 41-54, Feb., 1929. Successful freight-car refrigeration requires uniform controlled inside temperatures as low as 10 deg. F., allowing for precooling a car for use on not more than 24 hours' notice and for maintenance under severe service conditions with little inspection, service, or adjustment. A trial has been made in the application of the silica gel adsorption system to meet these requirements. Mechanical details of the car construction and the adsorption system are described and illustrated. Several advantages were observed in actual operation. As compared with ice cooling, lower and more uniform temperatures can be maintained; space for the refrigerating apparatus is decreased 50 per cent; longer cars can be operated; the ice water or brine nuisance is eliminated, and time is saved in handling en route.

COPRA PRODUCTION. H. W. Jack. *Malayan Agricultural Journal*, 16, 184-8, Aug., 1928. There is a considerable variation in yield per acre of copra, but the variations are not regular from one locality to another, so that the general average remains fairly constant from year to year. Average production costs are stated for picking and collecting the nuts and for husking, splitting, meat extraction, curing, sacking, and shipping. There are wide variations in most of these costs from one estate to another, according to local conditions and the skill of management, but the general averages are considered to be significant.

* * *

SUGAR EXPERIMENTS. W. Scott. *Sugar* 30, 550, Dec., 1928. A report of the experimental work in progress at the Imperial College of Tropical Agriculture, West Indies. An experimental factory has been installed and has successfully produced, on a sufficiently large scale to market its products, white refined and white plantation sugar, Demerara crystals and gray crystals (light and dark). Studies in progress include clarification methods, making a high-grade sirup direct from juice, making white sugar from remelted raw sugar and direct from juice, relative merits of preservatives for juice samples, hot versus cold liming, and the centrifugal and supercentrifugal clarification of sirups and molasses. Much of this program has progressed from the laboratory to the experimental factory.

* * *

CARBONATION. R. T. Balch and J. C. Keane. *Sugar* 30, 534-6, Dec., 1928. A second carbonation in sugar refining minimizes the amount of lime passing to subsequent operations. This lessens scaling of evaporators and other heating surfaces, facilitates boiling of the massecuite, and improves the quality of the product. Since this second carbonation requires exact control for best results, a pH control apparatus has been devised. The quinhydrone electrode not being applicable for sugar-house control, the use of tungsten electrodes for this purpose was developed. These electrodes are not suitable for the ordinary intermittent pH determination, but are quite sensitive, and work well in continuous control measurements. Sampling, and the construction and operation of the apparatus, are described and illustrated.

* * *

PAN BOILING. S. J. Saint. *Sugar*, Vol. 31, pp. 13-15, Jan., 1929. For successful pan boiling of cane or beet sirups, the supersaturation must be controlled within rather narrow limits. Experienced operators can judge fairly well by sight and touch; but this empirical control has numerous drawbacks. Use of the brasmoscope is better in some respects, but cannot be satisfactory, because accurate measurement of temperature within the pan is impossible. To improve the supersaturation control, the Löwe system of building a refractometer into the wall of the pan was tried in a refinery using the Geerligs absolute recovery (three-strike) process of pan boiling. On the basis of the theoretical relations connecting purity, coefficient of supersaturation, concentration, temperature, and vacuum, it is shown that control by refractometer has a better foundation on principles actually prevailing than brasmoscope control. A simple table was worked out whereby the operator could ascertain the correct concentration for a strike merely by observing the vacuum and the level of massecuite in the pan. It was then an easy matter to teach the operator to read the refractometer and to control the sirup feed according to whether the reading showed a concentration at, above, or below the correct concentration ascertained from the table. Practical experience, in actual production, confirmed the theoretical prediction that refractometer control of pan boiling is easier and more accurate than brasmoscope control.

* * *

EFFECT OF AN EXCLUSIVE MEAT DIET ON CHEMICAL CONSTITUENTS OF THE BLOOD. Clarence W. Lieb and Edward Tolstoi, of the Russell Sage Institute of Pathology. *Proceedings of the Society for Experimental Biology and Medicine*, January, 1929. The report says, in part: "This is a preliminary report of an experiment to study the effect on human beings of an exclusive meat diet of several months' duration. Our subjects were two Arctic explorers who had spent many years in the Arctic Circle, and who, while there, had lived for the greater part of the time on a practically 100 per cent meat-and-fat diet. Preliminary to our observations they were given careful physical surveys. Both were in excellent condition and showed no evidence of impaired health. Following these examinations, studies were made of the respiratory exchange, ketogenesis, protein balance, mineral metabolism, fecal bacteriology, hematology, and the chemistry of the blood. This report confines itself to the blood chemical findings. . . . The data may be summarized as follows: (1) Two healthy men who had lived exclusively on meat for eleven months, felt no untoward effects, maintained their weight, and were in excellent health. (2) We find no evidence of renal impairment. (3) The chemical composition of the blood is little affected, except for a slight increase in uric acid and a temporary lipemia. The latter occurred significantly and only after unusual amounts of fat were taken."

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CHEMICAL PLANT IN FLOOD PROCESSING. H. WINKELMANN. *Chemische Apparatur*, Vol. 15, pp. 217-8, 257-8, 279-80; Vol. 16, 14-16, Oct. 10, Nov. 25, Dec. 25, 1928; Jan. 25, 1929. Chemical apparatus displayed at the Food Show in Berlin, 1928, is reviewed insofar as noteworthy developments were shown. These include a simple viscometer for gelatins, starches, etc.; ultrafiltration apparatus for treating

meat juices, dairy products, and the like; an automatic drop-counting device for measuring surface tension; an improved interferometer; apparatus for following the colloidal behavior of many food materials; improved vacuum evaporators and driers, including a milk sugar rotary drier with dust collector, surface condenser and dry vacuum pump; machinery for washing and decorticating cereal grains without the aid of chemicals; a cold sterilizing filtration process for preserving cider and like juices without pasteurization or chemical preservatives; a bottle sterilizing machine; an automatic flour weighing scale; a packaging machine which fills, corks, seals, and labels bottles; and a gas-fired oven for bakeries. Illustrated.

· GOVERNMENT · PUBLICATIONS ·

Documents are available at the prices indicated from the Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated the pamphlet is free and should be ordered from the bureau responsible for its issue.

Shrimp Fishery of Southeast Alaska, by Frank W. Hynes. Bureau of Fisheries Document 1052. Ten cents.

Scallop Industry of North Carolina, by James S. Gutsell. Bureau of Fisheries Document 1043. Ten cents.

Oyster Bottoms of North Carolina, by P. S. Galtsoff and H. R. Seiwell. Bureau of Fisheries Economic Circular 66. Five cents.

Alaska Fishery and Fur-Seal Industries in 1927, by Ward T. Bower. Bureau of Fisheries Document 1040. Twenty-five cents.

Instructions for the Operation, Care, and Repair of Refrigerating Plants. Reprint of Chapter 17 of the Manual of Engineering Instructions, Bureau of Engineering, Navy Department. Twenty-five cents.

The Application of Sodium Fluosilicate by Airplane in an Attempt to Control the Sugar-Cane Moth Borer, by T. E. Holloway, W. E. Haley, and J. W. Ingram. Department of Agriculture Circular 41. Five cents.

Sorgo-Sirup Manufacture. U. S. Department of Agriculture Farmers' Bulletin 1389. Five cents. Describes varieties of sorgo, gives instructions for planting, cultivating, and harvesting, and describes methods for manufacturing sorgo sirup.

Sales of Confectionery. Mimeographed résumé report from R. L. Purdon, Bureau of Foreign and Domestic Commerce Food Stuffs Division, recapitulating monthly reports of sales through December, 1928, by groups of states.

Milk-Plant Equipment, by Ernest Kelley and Clarence E. Clement. U. S. Department of Agriculture Bulletin 890. Ten cents. Gives valuable information for use in selection of equipment, with list of machinery required for plants of various size.

Production of Crystalline Glucose from Wood in Germany and Switzerland. Bureau of Foreign and Domestic Commerce, Chemical Division, Special Circular 236. A brief mimeographed consular report outlining the development and scope of the Bergius process.

International Trade in Corn, by Theo. D. Hammatt. Bureau of Foreign and Domestic Commerce Trade Information Bulletin 591. Ten cents. A statistical review, with particular reference to the part which American production and American industry plays in the world business.

Government Specifications. Bureau of Standard Circular 371. Alphabetical and numerical list of requirements adopted by the Federal Specifications Board, governing purchases by the government for all departments, including many specifications for manufactured food stuffs.

Citric Acid. Two mimeographed trade reports on the situation in England, issued by the chemical division of the Bureau of Foreign and Domestic Commerce. Special Circular No. 237, British Citric Acid Trade, by Consul R. S. Castleman, London; and No. 244, Citric Acid Situation in England.

Market Research Agencies, by I. K. Rolph. Bureau of Foreign and Domestic Commerce, Domestic Commerce Series 6. Fifteen cents. The 1928 edition of the guide to publications and activities of various research agencies in the United States which deal with problems of domestic commerce and marketing.

Candy Distribution in the United States, by Rupert L. Purdon. Bureau of Foreign and Domestic Commerce, Domestic Commerce Series No. 23. Ten cents. An elaborate economic and statistical study showing marketing methods, magnitude of markets, and economic relations of the candy business, including raw materials, prices.

Proximate Composition of Fresh Fruits, by Charlotte Chatfield and Laura I. McLaughlin. U. S. Department of Agriculture Circular 50. Five cents. A résumé of the best available analytical results, both those previously published and those determined by various Department of Agriculture laboratories but previously unpublished.

Establishing a Cheese Factory, by H. L. Wilson. U. S. Department of Agriculture Miscellaneous Publication 42. Five cents. Points to be considered by those contemplating such enterprise, including a list of equipment required and operating supplies needed for factories handling 5,000 lb. to 20,000 lb. of milk daily. The recommendations relate primarily to small plants such as those owned by farm co-operatives.

Fisheries Statistics. Routine announcements are available regularly from the Bureau of Fisheries on landings by fishing vessels at the principal ports and of the holdings of fish and fish products in cold storage. Those desiring this statistical information should indicate not only the particular product, but the period for which statistics are wanted and the geographical area of the country in which they are interested.

Federal Antitrust Laws. Unnumbered document of the Department of Justice. Thirty-five cents. Includes a summary of federal laws and amendments, with a list of cases instituted by the United States, and citations of cases decided thereunder or related thereto. Important in its significance with reference to corporation mergers and trade practices which are permissible under the federal legislation now in force.

Sodium Phosphate. Mimeographed document issued by the U. S. Tariff Commission. A preliminary statement of information resulting from an investigation of the relative costs of production in the United States and abroad by the experts of the Tariff Commission. The report covers both food grades and commercial grades of monosodium, disodium, and trisodium phosphates, including statistics on production and imports in so far as returns on these are available.

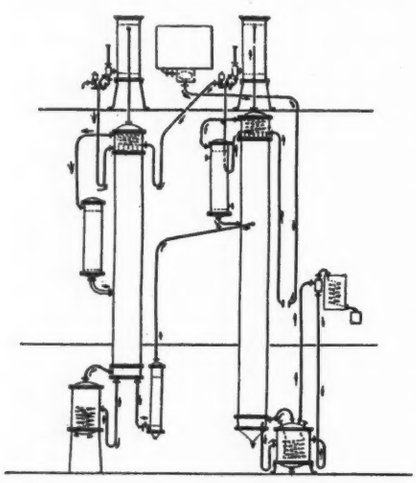
Food Manufacturing Statistics. Preliminary mimeographed reports from the Census of Manufactures for production in 1927 include the following foods and items of equipment of interest to the food industries: Slaughtering and Meat Packing, Wholesale; Macaroni, Spaghetti, Vermicelli, and Noodles; Soda-Water Apparatus; Tin Cans and Utensils; Mechanical Refrigerators and Ice Refrigerators. Statistics for more recent periods from the Census of Manufactures for: Spinach Canned in 1928; Glues of Animal Origin, Fourth Quarter, 1928; Edible Gelatin, Fourth Quarter, 1928; and Production, Consumption, and Stocks of Fats and Oils, Fourth Quarter, 1928.

· SELECTED · PATENTS ·

Continuous Rectification of Acetic Acid

Georges F. Legendre, Paris, France, assignor to Société des Etablissements Barbet, Paris, France. No. 1,698,798. Jan. 15, 1929.

The preparation of acetic acid from bacterial fermentation, carbonation of wood, or by synthesis, results in an impure and aqueous solution which must be purified by rectification. As acetic acid boils at 117 deg. C., the acid is an end product of a rectifying distillation and the still is so designed that the escaping water vapor will carry away as little acid vapor as possible. Rectification is best carried out in a continuous distilling apparatus for several reasons,



Continuous rectifying still

one of which is heat economy; another is the advantage that copper, in the absence of air, is not attacked by acetic acid, but where air is present the reaction is marked.

Cheese Formula

H. H. Kaufmann & A. H. Kaufmann, Cascade, Wis. No. 1,694,921. Dec. 11, 1928.

A new method of making curd cheese, the object of which is to avoid waste and rehandling. It permits placing the cheese upon the market at an early period after manufacture. The curd is produced by any suitable method, such as adding rennet or pepsin to milk. Coloring matter is optional. The curd in 100-lb. units is ground until it is in a granular or fluffy mass; to it is added approximately 3 lb. of sodium phosphate, or other emulsifying agent, mixed with about 25 lb. of water. The water solution of the emulsifying agent is thoroughly mixed with the ground curd and allowed to stand for about 90 min., followed by heating in a kettle equipped with a mechanical stirrer. It is heated to about 150 deg. F., or until it is thoroughly melted. The next step is the addition of about 98 lb. of ground cheese. The addition of the cheese reduces the temperature to about 150 deg. F., and the mass is stirred until it is thoroughly melted. The cheese is now ready to be poured into tinfoil-lined containers after which it is put into a cool place to be stored for shipment. It is claimed that the cheese will not bloat at any time when prepared in this manner and that there is no loss of cheese due to rind, nor expense for bandage.

Grain Washer and Drier

Timothy C. Manning, Omaha, Neb. No. 1,697,875. Jan. 8, 1929.

A machine which will wash, clean and dry grain for the removal of dirt, smut spores, nematode gall dust, preparatory to milling the grain into flour. It will moisten the grain, cleaning and drying the wheat with a minimum addition of water to the content of the wheat in a manner in which the percentage of water added can be accurately controlled. The grain falls down a vertical chute equipped with inclined baffles staggered on opposite sides of the chute, and in falling passes a spray pipe where it is moistened with water at a rate which may be regulated either by the pressure of the water or the volume of the grain falling. The grain falls from the chute into the smaller of two cylinders, mounted longitudinally on the same shaft. These are equipped with baffles and other devices which cause the grain to move around and longitudinally across a series of small holes, which permits the water to drain out and also fans the grain. Ultimately it discharges into the larger cylinder and then out a discharge spout, thoroughly clean. The dirt and other refuse falls through the holes of the two cylinders into suitable troughs below and is carried away by screw conveyors. It is claimed that in practice this machine will moisten, clean, and dry smutty and dirty grain with less than one-half of one per cent addition of water to that which is already present in the grain.

Vegetable-Skinning Process

Minnie B. Taylor, of Los Angeles, Calif. No. 1,699,456. Jan. 15, 1929.

A mixture of sodium chloride and sodium bicarbonate in equal proportions is placed in boiling water, and vegetables are then put in it for a predetermined time, following which they are removed and cooled. After this treatment the skin comes off easily.

Combined Continuous Cooker and Cooler

Albert H. Thompson, San Jose, Calif., assignor to Anderson-Barngrover Manufacturing Company, San Jose, Calif. No. 1,694,996. Dec. 11, 1928.

The invention is an improvement of the Anderson-Barngrover continuous cooker and cooler in which separate cookers and coolers are used, but the can traveling from one unit to the other is maintained under pressure as a means of avoiding strains on seams and can bodies. The invention consists of an inclosed can track in which pressure may be maintained by means of compressed air at the same figure that is held within the cooler, thus avoiding the strains caused by sudden emergence of hot cans.

Honey Butter

Glenn G. Griswold, Madison, Ohio. No. 1,686,556. October 9, 1928.

Extracted honey is formed into a sort of butter by a means which can also be applied to any permanent sirup, such as maple sirup, producing a permanent emulsion that will resist elevated temperatures and retain its creamy smooth appearance without any granulation. In practice, 1 oz. of powdered dried egg albumen is mixed with 4 oz. of cold water and the mixture beaten to a froth. To this froth 1 gal. of extracted honey is added at a temperature of about 150 deg. or higher. Apparently the best results will take place at a temperature of 180 deg. F. The mixture is agitated for about 20 min. until a creamy paste without grain is produced.

Peanut Butter That Will Not Stick in the Mouth

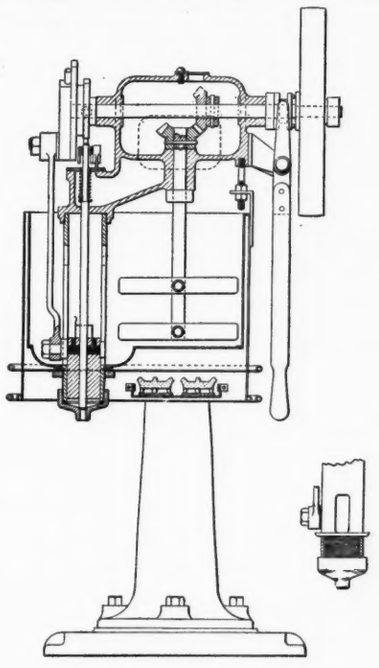
Donald W. Howe, Biloxi, Miss. No. 1,696,766. Dec. 25, 1928.

Peanut butter has a tendency to stick in the mouth, because the paste produced by grinding is dry. In the present invention this is avoided by incorporating in the peanut butter a powdered material ground fine, presenting a large area of surface upon which saliva may act. A large variety of substances may be used for this purpose, such as powdered fruit juices; dextrins; proteins; sodium, potassium and ammonium; salts of acids, such as the chlorides, sulphates, tartrates, citrates, lactates, acetates, malates. The higher the solubility of the incorporated powder, the greater its effect in reducing the clogging effect in the mouth.

Chocolate-Depositing Machine

William E. Prescott, of London, England, assignor to Baker Perkins Company, Inc., Saginaw, Mich. No. 1,699,447. Jan. 15, 1929.

An adjustable machine for depositing a semi-liquid substance such as chocolate. It consists of a reservoir, containing electrical heating units that will



Chocolate pump

maintain the substance in a liquid condition, and a pump at one side operated by an adjustable eccentric motion. The principal feature of the device is the mechanically operated valve, which opens and closes with each stroke of the pump. The amount of substance delivered by the pump may be varied.

Process of Curing Ripe Olives

George S. Hewett, Corning, Calif. No. 1,695,489. Dec. 18, 1928.

The process is a method of preparation of ripe olives in a dry, crisp state instead of the better known method of canning. The olives are placed in a brine solution, containing ½ lb. of sodium chloride to each gallon of water, and held there until fermentation sets in. They are then removed from the initial solution and placed in a solution of 2½ oz. of lye and 2½ oz. of salt to 1 gal. of water, and are held there for about 48 hours. Although the bitter taste of the olives has not yet been overcome, they are taken from the solution, washed in cold water, placed in fresh lye, salt and water, and allowed to remain there until the bitter taste is entirely removed. Next they are washed and soaked in cold water, and then they are placed in a solution of ½ lb. of salt to 1 gal. of water for 48 hours, and then drained. The olives are next dehydrated until they are thoroughly dry. Then they are plunged into a boiling hot brine solution containing ¼ lb. of salt to 1 gal. of water. After about 1 min. in this solution they are removed and placed in an oven at a temperature of about 300 deg. F., which is gradually increased to 450 deg. F. They are left in the oven for a period of twenty to thirty minutes, or until crisp; then they are removed and dusted with finely powdered salt in the proportion of about ¼ lb. of salt to 1 gal. of olives. It is claimed that the natural oil and flavor are retained and that the olives are in a tender and palatable condition capable of keeping indefinitely in any climate.

Preventing Blackening of Canned Foods

Kokichi Oshima, of Sapporo, Japan. No. 1,686,393. Oct. 2, 1928.

A method of preventing the blackenining of canned foods, such as crabs, lobsters, corn and the like, which turn black due to the formation of iron sulphide. The process depends upon the raising of the acidity of the food to a pH which lies between 4 and 7 by means of a buffer solution. The solution recommended consists of salt and a mixture of sodium acetate solution and acetic acid, and is added in the proportion of one-half pound of a mixture to a half pound can of crab meat.

A Real Use for Lactose

E. M. A. Sthamer, Hamburg, Germany. No. 1,696,507. Dec. 25, 1928.

The actual title of this patent is "Foam-Producing Composition." Dairy chemists have frequently lamented the fact that lactose, the sugar from milk, has never been found to be of any particular economic value in the industries, for previously it has been shown that whatever lactose can do can always be done better and cheaper by some other sugar. However, in this patent, what appears to be a real use for lactose is described.

Foam is of value in producing table luxuries, in the cosmetic industry, and in fire extinguishing apparatus of certain types. For many foams, saponin, a comparatively expensive material, is used. It has been discovered that the addition of lactose or milk sugar to the saponin improves the formation of the foam, giving a better and more lasting foam, as well as reducing its cost.

Copies of Patents

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Photostatic copies of foreign patents may be obtained at the same address, prices being forwarded on application.

Meat Paste

Richard W. Dyer, Newfield, N. J. No. 1,697,857. Jan. 8, 1929.

The process of making a paste from domestic fowl, such as pigeons, chickens, ducks, turkeys, geese, or guinea fowl. A large number of the birds are cooked together in a closed steam-jacketed kettle under a pressure equivalent to 260 deg. F., at which temperature the bone structure is freed from its gelatinous constituents, and after two or three more hours of cooking the flesh and juices are mixed together in a smooth paste.

The bird may be ground into a fine state either before or after cooking. After manufacture of the paste it is sterilized in hermetically sealed containers.

Method of Reducing the Viscosity of a Liquid

Edward A. Snow, Reading, Mass. No. 1,690,799. Nov. 6, 1928.

In manufacturing ice cream, the common practice is to homogenize the mix preparatory to cooling, ageing, and

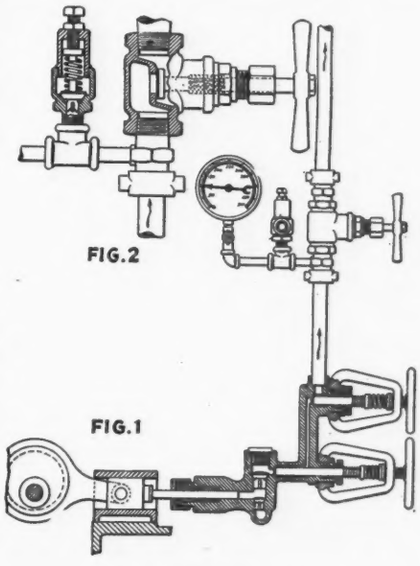


FIG.2

FIG.1

"De-viscifying" system

freezing, so that the product will be free from lumps and be smooth in texture. The effect of homogenization is such that it thickens the fluid and when cooled it reaches a degree of viscosity as often to prevent flowing at all.

To reduce the viscosity of the liquid this invention utilizes a constriction in the so-called take-off or discharge pipe. It is so regulated that the back pressure produced by the construction is less than the homogenizing pressure. By reducing this pressure to about 100 lb. back pressure, the passage of the viscous fluid through it will "de-viscify" the mix. Homogenization is best carried out between 110 deg. F. and 150 deg. F., but the operation of reducing the viscosity takes place best at 110 deg. F.

PRACTICAL · OPERATING · DETAILS

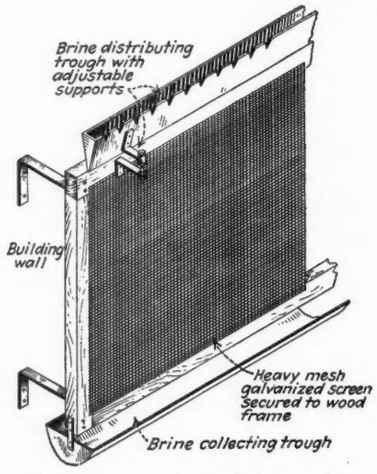
Let Old Man Winter Cool the Brine

By Robert S. Wheaton
Milwaukee, Wis.

LAST summer we built an ice-machine installation in order to clarify a high-grade linseed oil by cooling and subsequently removing the precipitated impurities—another use for the ice machine, which is finding more and more applications in industry as the years roll by. Prior to this, the manufacturer would make this grade of oil only in the winter time.

We are not, however, giving enough attention to the utilization of the cold air of winter by the simple process of making that air cool refrigerating brine normally used in industry. A case in point is a creamery or dairy using brine to chill milk and cream after pasteurization. The typical construction of a dairy or creamery of moderate size—shown in the diagrammatic sketch—is to have a cold room with a brine tank in the bunker loft, and also a brine pump to circulate the brine from the tank through a milk-cooling element or a cream vat.

If an atmospheric brine cooler of the sort illustrated herewith were to be placed on the outside wall of the building next to the brine tank, connected in series with the tank pump and cooling elements, and the brine pump started, it would be possible, on many occasions to obtain cold brine without operating the ice machine. The head on the pump would be increased only a few feet, so that the existing pump might be used, and enough brine cooled, to care for the manufacturing process as well as cool the storage box. A bypass around the cooling element would be necessary, so that the brine could be cooled sufficiently before the element was cut in, and of course the outside return from the atmospheric cooler would have to


Brine distributing trough with adjustable supports
Building wall
Heavy mesh galvanized screen secured to wood frame
Brine collecting trough

End of atmospheric brine cooler fastened to building wall

be valved, so that rain water could not flow into the brine tank and thus weaken the brine.

A simple type of atmospheric cooler resembles an atmospheric condenser coil with a distributing trough along the top and a collecting trough along the bottom, but with galvanized screen of coarse mesh stretched between the two instead of coils. The cost of such equipment is small, and, if the plant is so located that there are a considerable number of days when the outside temperature is 15 deg. F. or less, the scheme merits the attention of those wishing to reduce operating costs and take advantage of cold weather periods to overhaul their ice machine.

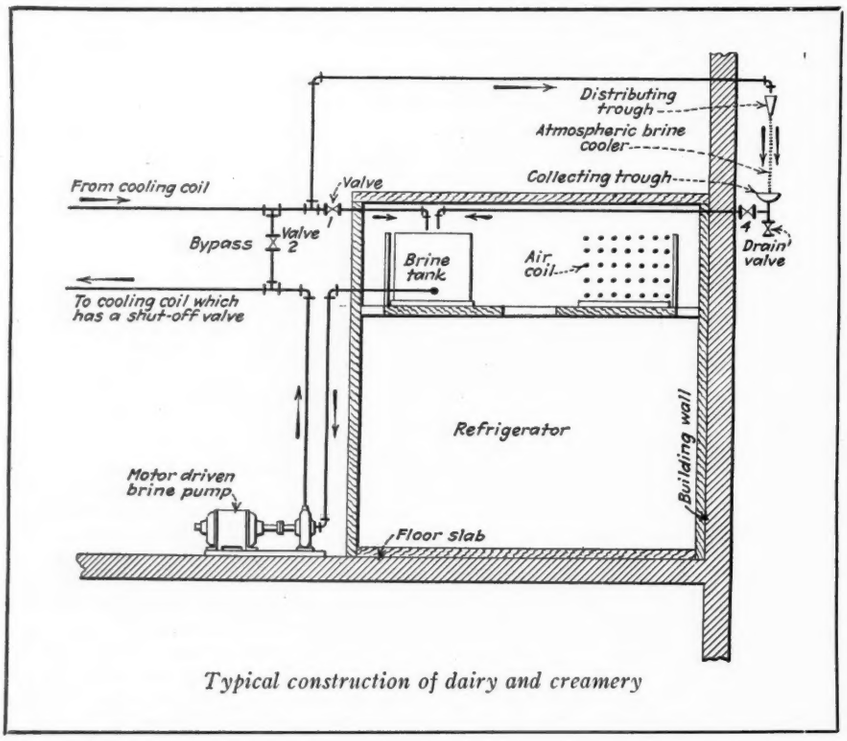
The following details of operation may be emphasized:

For cold air operation, close valve 1, open valve 2, and, with shut-off valves on cooling coils in plant equipment closed, circulate the brine around the circuit composed of the atmospheric brine cooler, brine tank, and pump.

To cut in cooling elements in plant equipment, such as the brine section on a milk cooler, close the bypass valve 2 and open brine valve on the milk cooler or other apparatus.

When shutting down the brine pump because of high outside temperature, close valve 4 and open drain valve on collecting trough. This will prevent rain water from flowing into the brine tank and ice from bursting the return connection at the drain valve.

With this arrangement of connections the brine can be circulated prior to the cooling time in the plant routine so that a tank full of cold brine may be made ready for duty; also the brine can be circulated after cooling time and the refrigerator thereby cooled.



Typical construction of dairy and creamery

Gobel Company Gets Control of Jacob Decker

Adolph Gobel, Inc., has obtained control of Jacob Decker & Sons, of Mason City, Ia., through acquisition of approximately 80 per cent of its common stock. The deal involved the exchange of four shares of Gobel for each share of Decker. There are 14,498 shares of Decker common outstanding. The Decker purchase will give Gobel an adequate supply of raw materials of a sort not produced by its plants in the East, as well as a western plant which is doing a business larger than $15,000,000 annually.

Best-Clymer Company Sold

The business and assets of the Best-Clymer Company, of St. Louis, have been sold to the newly formed Preserves & Honey, Inc., of Brooklyn, for a sum in the neighborhood of $1,000,000, including a three-year option on the St. Louis property. The business will be operated as a subsidiary of Preserves & Honey, Inc., and will be known as the Best-Clymer Division. The transaction ends the Best-Clymer Company, for it is to be liquidated immediately. Shareholders will receive approximately $7 a share.

The purchasing company was organized recently with an authorized capital of $5,000,000 to take over the business of several large honey-packing and preserving companies. J. B. Thomy, formerly a president of Best-Clymer, is president of Preserves & Honey.

· WHAT'S · ON · YOUR · MIND? ·

An open forum for the exchange of opinion

Nitrogen Canning Experiments Said to Be Successful

To the Editor of "Food Industries":

Regarding the experiments conducted here for some months by Thomas F. MacGregor, Philadelphia scientist, with nitrogen under positive pressure as the basic principle of his efforts to preserve the products of farm, field and orchard in the "raw," or natural state, I will say that a great meed of success has followed the same.

As secretary of the Hammonton Chamber of Commerce I was authorized to select a committee to supervise these experiments. The men chosen were leaders in their respective lines, which included peach growing, cranberry and dahlia culture, banking, and education.

Thirty days after the first peaches had been "processed" with nitrogen, a container was opened. The fruit was found to be in excellent condition, but the free-stone "Early Elberta" had become, apparently, a "cling-stone" peach. On later openings the explanation was apparent, for the warehouse people had placed the containers in freezing temperature instead of in mere cold storage. Peaches, at any stage of the game, are injured by freezing temperature.

Sugar corn on the cob, of both the "Golden Bantam" and "Country Gentleman" varieties, taken out the day before Thanksgiving, after having been kept for 70 days, was found in perfect condition, and formed one of the tidbits at Thanksgiving Day dinners here. There is no doubt at all that sugar corn on the cob can be kept in perfect condition for the holidays.

A delicious grape, known here as the "Adams," but more generally as the "champagne grape," was processed, although Mr. William H. Parkhurst, of Hammonton, the grower, said that they could not be kept; or if, perchance, that were possible, they would fall from the stems. Thirty days later they were found to be in perfect condition, and were re-processed. At the end of another 30 days they were found to be in first-class condition, all on the stems, barring a few which had been injured in removing them from the vines, and which were eaten for three weeks after the second opening of the container, really tasting better than when first picked.

Nurseries mark this grape "Not a shipper." I can truthfully say that I feel sure these grapes can be easily shipped, in the sealed containers, to any part of the world, and be enjoyed by millions who never taste that delicious grape.

THOS. B. DELKER.

Hammonton, N. J.

Moisture-Proof Containers?

From California we have received the following communication, which contains information of value to those who are packing in paper packages:

"An article in the December number, describing packing, refers to paper or cardboard containers as being moisture-proof. Anyone who has had experience in packing moisture-containing or moisture-absorbing foods in paper containers knows that there is no such thing as an 'air-tight' or 'moisture-proof' paper container. Even the tightest sealed container, waxed or paraffined, will permit a slow but steady exchange of air and the water vapor which all natural air contains. The best that can be said of such containers is that they are moisture-retardent and as such are adequate for many products.

"I have conducted and reported many experiments on processed dried fruits. All of these showed that the moisture content of the product would eventually establish an equilibrium with the humidity of the surrounding air, regardless of what sort of a paper container the product was in. Only an hermetically sealed, impervious container, such as a tin can or glass jar, can be truthfully said to be air-tight or moisture-proof."

[The manufacturer of the product described finds that the package used is sufficiently moisture-proof, so far as his experience with this class of goods is concerned. The shelf life of his goods far exceeds the time required to place the goods into consumption. It would appear that this is an instance where merchandizing policy and advertising might have an indirect effect on the requirements of the package.—EDITOR.]

* * *

Divided We Fall

To the Editor of "Food Industries":

Recently I sat in a meeting with thirty-odd members of a national association, including the board of directors, to discuss a federal ruling of vital importance to a large section of its membership. For some it might mean a revision of product; for others it might mean a new and less pleasing phraseology on the label; for others, again, it might mean loss of business to an alarming degree; to a fortunate few it meant nothing new at all. The discussion was lengthy. A motion was made to refer the matter to a committee which was to secure a rehearing at Washington with a view of obtaining modification of the ruling.

"All in favor, please vote by saying 'Aye'," directed the president.

"Aye," voted *two* voices coming from widely separated parts of the room.

"All opposed, please vote by saying 'No'," said the president.

"No," came from a single, lonely voice.

Twenty-seven other interested members sat silent, and looked uncomfortable.

I have a suspicion that the federal ruling will stand as it now is.

G. HELPUS.

Buffalo, N. Y.

* * *

A Correction

To the Editor of "Food Industries":

In my article on the Roasting of Cocoa, which appeared in *Food Industries,* I regret that I erroneously reported the work of Bainbridge and Davies as having emanated from the laboratories of Cadbury's, instead of from those of Rowntree & Company, Limited, York, England, to whom full credit should be given.

Will you please publish this correction?

FRANK C. GEPHART.

New York.

To Form Grocery Store Products, Inc.

A merger of the Foulds Milling Company, manufacturers of macaroni products, Kitchen Bouquet, Inc., and the Toddy Corporation, manufacturers of a prepared chocolate drink, is being formed by George K. Morrow, president of the Gold Dust Corporation. Mr. Morrow is a large stockholder in Toddy. The new corporation is to be called Grocery Store Products, Inc.

McCann to Head Dry Milk Institute

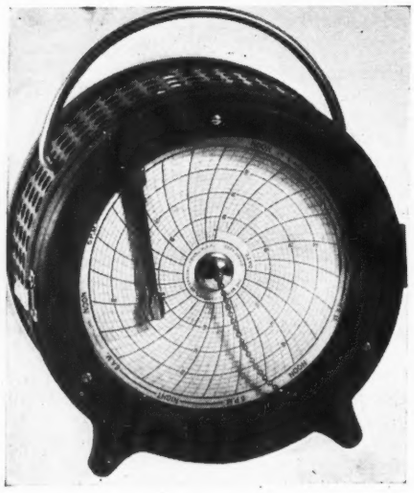
Prof. Roud McCann, Director of Agricultural and Home Economics Extension for Colorado, has been selected by the executive committee of the American Dry Milk Institute to fill the position of director—left vacant when Dr. H. E. Van Norman resigned to take charge of research and development work for the Borden Company.

Professor McCann was born on the farm. He has been Deputy Dairy Commissioner for Colorado, Associate Professor of Dairying, Executive Secretary of the Colorado Butter Manufacturers' Association, Secretary of the Colorado State Dairymen's Association, and a member of the National Dairy Council.

MANUFACTURERS' · NEWS · AND · EQUIPMENT

Small Portable Temperature Recorder

In a small size "Handy Bristol's Recorder," offered by the Bristol Company, Waterbury, Conn., a 72-hour record of temperature is made on a 4-in. chart. Particularly adapted for checking temperatures, especially of cold

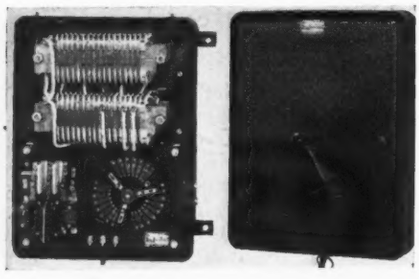


Portable temperature recorder

or cool storage, it is available for the following ranges: 25 to 125 deg. F.; 50 to 90 deg. F.; 30 to 70 deg. F.; —20 to —80 deg. F.

New Speed Controller for Fans and Blowers

The General Electric Company has announced the development of a new speed controller for slip-ring induction motors, primarily intended for the control of motors driving ventilating fans in buildings. This new device, bearing the designation CR-7765-B-1, has the primary magnetic switch, dial-type con-



Speed controller for fan and blowers

troller and speed-regulating resistance mounted in a sheet-steel enclosing case.

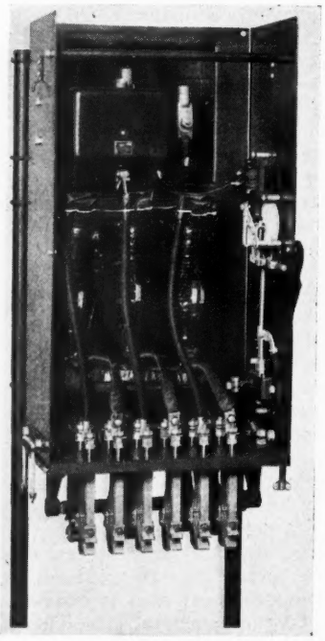
Applications of the new controller will be to motors driving ventilating fans, blowers and other machines where the amount of torque required decreases as the speed is reduced. The controllers provide overload and undervoltage protection, and will give approximately 50 per cent speed reduction by inserting resistance in the rotor circuit.

Each controller consists of a line contactor, a temperature overload relay, a secondary dial switch operated from the outside of the cover, a resistor, and a "start-stop" push-button station. The enclosing case is ventilated and provided with knockouts in the top and bottom.

In operation, the line contactor is closed by pressing the "start" button, thus starting the motor. Speed regulation is obtained by moving the dial switch arm on the front of the inclosing case. The dial switch and line contactor are not interlocked, and consequently the motor will come up to the speed corresponding to the setting of the dial switch. It is therefore possible to throw the motor directly on the line with all resistance cut out of the secondary, where the dial switch arm is in the full speed position. Stopping the motor is accomplished by pressing the "stop" button.

New Compensator

The CR-1034-K-33, a new manual starting compensator announced by General Electric, has a high interrupting capacity. It is especially applicable to the control of high-speed, squirrel-



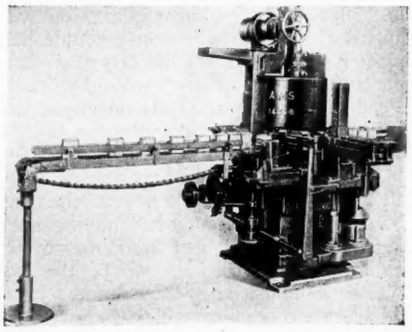
High interrupting capacity compensator

cage motors, including all two- and most four-pole motors, particularly those driving loads of relatively high inertia and therefore taking high inrush currents and requiring considerable time to get up to speed. For such applications the high capacity of the contact mechanism of this compensator should be of value.

Among the advantageous features claimed for the new compensator by the manufacturer is the time-delay under-voltage release, preventing shutdown on brief power disturbances and assuring that, in case of short circuit, the line protective devices will open first.

Automatic Sealing Machine for Square Cans

A new model of automatic square can-sealing machine was shown for the first time by the Max Ams Machine Company, of New York City, at the 1929 canners' convention. It is designated as the Ams No. 1445-B automatic square can double seamer. By the use of the clover leaf-shaped seaming rolls instead of the usual circular rolls, and other improvements, the capacity of the machine is roughly 75 cans per minute,

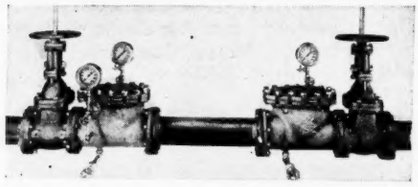


Automatic square can double seamer

a speed that compares favorably with that of automatic single spindle closing machines for round cans.

Valves for Fire Protection Service

To permit the pumping of water from questionable sources into factory standpipes and sprinkler lines during fires, without the danger that polluted water may be forced back into municipal sup-



Valves for fire protection service

plies, Jenkins Brothers, of New York, have developed the "F M" special all-bronze swing-check valves.

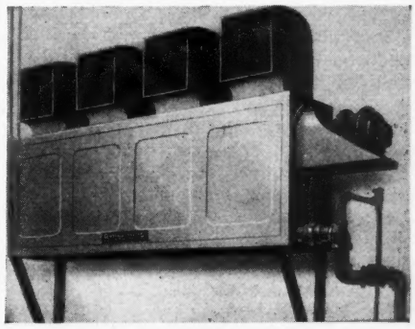
The problem of safeguarding public health, even under emergency conditions, is of great importance. In some states direct pipe connections between private and public supplies are positively prohibited. This regulation is the result of failures of valves and checks to prevent pollution from passing into potable water supplies when pressure conditions have been favorable for such an infection.

The "F M" valves are faced with rubber disks to insure a tight fit, and, when employed in fire protection service, are best used in pairs, with a sufficient distance between them so that any rubbish which may find its way into the pipe is not likely to cause both valves to stick open simultaneously. Pressure gages and small valves for testing for leakage are shown in the illustration. Construction is in accordance with specifications of the Associated Factory Mutual Fire Insurance Companies.

The New Buffalo Lowboy and Highboy Heaters

A new line of unit heaters, compact and more pleasing in appearance than former types, was recently announced by the Buffalo Forge Company, Buffalo. These heaters are of two types — the Lowboy and Highboy. The Lowboy consists of one section of paneled casing, while the Highboy is made up of two sections.

Considerable ingenuity has been used to keep the assembly simple and universal. Complete rotor and shaft can be removed through end plates without disturbing the top of fan casing or fan housing. The motor bracket end plate and the outboard end plate are interchangeable, so that the drive can be placed on either end. The motor bracket can be revolved to any position of discharge. The heating element is made up of Universal Aerofin suitable for pressures of from 2½ lb. to 150 lb. Aerofin is the original fin tube heater, light in weight, efficient, and non-corrosive. This heater element can be removed from either end of the unit through end plates. It can be assembled with steam or drip connections on either end as desired. The multirotors are of the centrifugal type, each in its own fan housing, so designed as to deliver a large volume of air quietly and efficiently. The rotor is of the multiblade type, using a modified backward tipped blade which is positive in its air delivery and will effectively force the warm air over a large working area.



Lowboy unit heater

Highboy and Lowboy heaters are suitable for almost any space or structure. The width is purposely kept down to the minimum, so that they will fit in conveniently between girders and beams. They can be installed vertically, horizontally, or inverted, and they are suitable for floor mounting, wall bracket mounting, or ceiling suspension.

Manufacturers' Latest Publications

Fused Quartz. General Electric Company, Schenectady, N. Y.—GEA-848, describing the manufacture and uses of fused quartz.

Glass Linings. The Pfaudler Co., Rochester, N. Y.—Vol. 4, No. 3 of the company's house organ, being devoted to pasteurization.

Elevator Control. General Electric Co., Schenectady, N. Y.—GEA-985. Bulletin describing General Electric Company's system of elevator control.

Insulation. General Insulating & Mfg. Co., Alexandria, Ind.—Bulletin 300, describing rock wool, insulating block, insulating brick, and insulating cement.

Electrical Testing. Wagner Electric Corporation, St. Louis, Mo.—Bulletin 138, constituting a manual of testing motors, generators and transformers.

Insulation. General Insulating & Manufacturing Company, Alexandria, Indiana.—Bulletin 400, describing rock wool and flexfelt insulation for industrial ovens, and pipe covering, together with quantitative data regarding its insulating power, sound transmission, and density.

Insulation. General Insulating & Manufacturing Company, Alexandria, Ind. —Bulletin 401, describing the use of rock wool cork for insulation purposes. Includes 26 pages of quantitative data relative to the physical properties of this product as compared with other well known substances.

Pasteurizers. The Pfaudler Company, Rochester, N. Y.—Catalog No. 701, entitled "New 1929 'C-Gals' with Complete Plant Hook-ups," describing "C-Gals" pasteurizers in capacities of 60, 100 and 200 gallons. Also describing the new Pfaudler plug type leak-detector flush-valve. Diagrammatic plans of ice cream plants.

Electrical Equipment. General Electric Co., Schenectady, N. Y.—Publications as follows: GEA-876B, Type WD-400A arc welder; GEA-874C, Type WD-200A arc welder; GEA-408A, electric heating equipment for industrial ovens; GEA-913A, automatic time switches, motor operated; GEA-1006A, automatic supervisory equipment, synchronous selector type; GEA-941A, motor-driven, reciprocating air compressors for railway and industrial use; GEA-823B, equipment for atomic-hydrogen arc-welding; GEA-1022A, bulletin describing automatic arc welder for steel railroad ties; GEA-1084, plate-type field rheostats.

Metals and Alloys. William J. Sweet Foundry Company, Inc., Irvington, N. J. —"Sweetaloy Castings," being a chart giving detailed information regarding physical and chemical properties of alloys of the "stainless steel" type, with recommendations for their use with corroding media, found in the food industries, such as brines, sulphur dioxide, and acetic, lactic, citric, and tartaric acids. Uses under corroding service in other industries are also described.

Boilers. Mars-Kane-Ofeldt, Inc., 1903-1905 East Hagard St., Philadelphia, Pa.—Four-page folder describing Kane gas-fired boilers of small size for process steam.

Can Making Machinery. Adriance Machine Works, Inc., 80 Richard St., Brooklyn, N. Y.—Catalog describing improved slitting machine for cutting tin plate for can bodies.

Canning Machinery. The United Company, Continental Trust Building, Baltimore, Md. — Bulletin entitled "Facts," giving the comparative performances and cost of husking sweet corn, as carried out by various makes of huskers.

Canning Equipment. The Pfaudler Company, Rochester, N. Y.—Bulletin 703 describing Pfaudler cookers for evaporation and the new method of returning a part of the condensate to the live steam line in order to produce a film of water over the inside of the copper tubing to prevent scorching of product on the outside.

Canning Machinery. The Max Ams Machine Company, New York.—Two-page folder illustrating the progress of the Amsco-Junior Closing Machine from 1896 to date.

Bulletin No. 1445-T. Folder describing the completely automatic double seamer for square, rectangular and irregularly shaped cans.

Vacuum Evaporators. The Glascote Company, Euclid, Ohio. — Four-page folder describing Glascote vacuum cooking, showing a vacuum pan in which not only the interior is glass coated but also the exterior of the heating coils.

Canning Equipment. Josiah Anstice & Company, Inc., Rochester, N. Y.— Sterling vegetable peelers, splicers, dicers and cutters. Descriptions and capacities of each type are given.

Combustion Equipment. Combustion Engineering Corporation, New York.— Reprint of an article by Walter Siegerist, entitled, "The Boiler House in the Oil Refinery." A study of large boilers operating under heavy loads in oil refineries, presenting data which may be applicable and helpful to other industries.

Lignite as a Commercial Fuel. Reprint of a paper published in the bulletin of the National Electric Light Association, September, 1928, describing the combustion of lignite in pulverized form.

Essential Oils. Fritzsche Bros. Inc., New York.—Wholesale price list of essential oils, aromatic chemical preparations, liquid essences, compounded aromatic perfume fixtures and certified colors.

· NEWS · ITEMS ·

Macaroni Association Discusses Costs

THE BOARD of directors of the National Macaroni Association assembled at the Hotel Astor, New York, on Jan. 29 last, in an executive session, followed by a general meeting which was attended by a large number of eastern manufacturers. President Frank Tharinger, of Milwaukee, pointed out that compensation insurance was an item of cost which could be reduced materially. Members present reported rates of from $0.90 to $5.80 per $100 on the payroll. Although few of the larger factors were self-insuring, the majority felt that they were unjustly penalized by rates based on statistics apparently quite different from their own.

Savings of several thousand dollars a year were reported by a few manufacturers who had been sufficiently active to obtain readjustment or rates more in conformity with existing hazards. It developed that premiums of over $1,000 had been paid by some members for compensation insurance where actual claims paid out amounted to less than $100. A committee was appointed to secure a revision of rates.

The educational work of the association was also discussed and a substantial sum voted for its continuance. Defensive activities of the educational committee have been particularly valuable as a means of offsetting some of the erroneous statements of pseudo-scientists which have been given wide circulation.

The directors voted to hold the 1929 national convention in New York City from June 18-20 next.

Two New Food Dyes to Be Certified

TWO NEW FOOD DYES have been approved for addition to the list of colors which will be certified by the Department of Agriculture, according to an announcement by the Food, Drug and Insecticide Administration. The full text of the statement follows:

"These colors, which will be known as Buttercup Yellow and Ponceau S. X., have been tested both chemically and physiologically and found suitable for food use. Copies of the descriptions, specifications and special analytical methods will be sent upon request by the Food, Drug and Insecticide Administration.

"Two months subsequent to Jan. 28, 1929, these colors will be officially placed on the permitted list by the issuance of a supplement to Service and Regulatory Announcements, Food and Drug No. 3."

New Testing Device to Shell Rough Rice

FOR USE in removing hulls from samples of rough rice, and for indicating the hardness and the milling yield, a rice-shelling device has been invented by W. D. Smith, grain marketing specialist, bureau of agricultural economics, U. S. Department of Agriculture. The full text of the statement issued by the department follows:

"Rough-rice buyers and graders make 'shellings' of samples prior to buying or placing a valuation on the rice. In commercial practice the price that is offered for any given lot of rough rice and the selection of rough rice for milling purposes are based largely on these 'shelling' tests. In most cases the hulls are removed by placing the rice on a corrugated board and rubbing it with a small corrugated wooden block. The Smith shelling device does this work mechanically, which, according to the inventor, is less likely to vary than tests made by hand. The shelling device makes it possible to apply a standard, unvarying test to determine hardness or milling quality of rough rice, and to grade rough rice for the factor of milling quality more satisfactorily than heretofore."

COMING EVENTS

MARCH

5-7—Dairy Manufacturers Conference, Univ. of Illinois, Urbana, Ill.
6-7—Indiana State Bottlers Protective Association, South Bend.
6-7—Carbonated Beverage Manufacturers Association of Michigan, Grand Rapids.
8-9—Annual Convention, Utah Canners Association, Ogden.
12-14—Wisconsin Bottlers of Carbonated Beverages, Oshkosh.
13—Annual Business Meeting, Dairy Products Association of Kentucky, Louisville.
25-28—Annual Convention, American Society of Bakery Engineers, Chicago.
26-27—Kansas Bakers Association, Wichita.

APRIL

15-17—Rocky Mountain Bakers Association, Denver.
16-17—Associated Bakers of Illinois, Joliet.
16-18—Nebraska Bakers Association, Omaha.
28-1 — Texas Bakers Association, Dallas.
29-3—American Chemical Society, Columbus, O.

MAY

5-7 — Southern Bakers Association, New Orleans.
6-8—Associated Bakers of America, Buffalo.
6-10—American Association of Cereal Chemists, Kansas City, Mo.
6-11 — Chemical Industries Show, New York.
13-14—N. Y. Association of Manufacturing Retail Bakers, Buffalo.
14-16 — Iowa Bakers Association, Cedar Rapids.
19-21—New England Bakers Association, Swampscott, Mass.
20-22—Missouri Master Bakers Association, Kansas City.

Pickle Packers Elect Officers

THE following officers were elected by the National Pickle Packers Association at their 36th annual convention held in Chicago, January 23: Lee Ballinger, of the Keokuk Canning Company, president; H. B. Blandford, of the Blandford Pickle Company, Fremont, Mich., vice-president; C. J. Sutphen, of C. J. Sutphen & Company, Chicago, treasurer; Joseph E. Mitchell, Attorney, Chicago, secretary.

The great production problem of the pickle industry—the gradually dwindling yield of the cucumber crop, seems to be on the way to solution, according to Prof. George E. Starr, of Michigan State College, who has been conducting work for the association since 1924. Professor Starr has developed a cucumber having a big healthy vine, which, in some tests, has proved to be extraordinarily prolific, and is disease-free. The problem is, however, only partly solved, for the total amount of the new seed on hand is 1,000 lb., while the annual need of the industry is at least a thousand times greater.

Board of Tea Experts to Select Standards

THE SECRETARY of Agriculture has reappointed the following on the United States Board of Tea Experts for the coming season: J. J. McNamara, New York, N. Y.; Harry L. Jones, Boston, Mass.; Arthur T. Hellyer, Chicago, Ill.; A. P. Irwin, Philadelphia, Pa.; Edward Bransten, San Francisco, Calif.; John N. Shaw, Seattle, Wash.; George F. Mitchell, supervising tea examiner, food, drug and insecticide administration, U. S. Department of Agriculture.

From the location of the different members of the board it will be noticed that there are two representatives from the western part of the United States, three from the eastern seaboard, one from the interior, and one appointed directly from the federal government. For many years the six members of the board have been selected from the importing and jobbing trade, but this year

J. J. McNamara, of New York, who recently entered the tea brokerage business, has been retained on the board, thereby furnishing a representative from this branch of the tea business. This is the first time that this branch of the tea industry has been represented on the tea board since Mr. H. B. Montgomery served from the New York district in 1899.

The duty of the board is to prepare and submit to the Secretary of Agriculture standard samples by which all teas entering the United States under the Tea Inspection Act of March 2, 1897, are compared as to their purity, quality, and fitness for consumption.

The first meeting was held at the United States Appraisers' Stores, New York City, on Feb. 11, when the tea standards which go into effect on May 1, 1929, were selected.

Corporation Earnings for 1928

National Biscuit Company—The National Biscuit Company reports for 1928 a net income of $17,883,365 after depreciation, federal taxes, and other charges, equal after 7 per cent preferred dividends to $7.31 a share on 2,209,520 shares of common stock. This compares with $16,277,158, or $7.10 a common share, in 1927.

General Baking Corporation — The General Baking Corporation and subsidiaries report for the year 1928 net profit of $7,545,789 after depreciation, federal taxes and other charges, equal after dividends paid on General Baking Company $8 preferred stock to minority holders of common stock and on General Baking Corporation preferred stock, to 46c. a share on 3,472,361 no-par shares of common stock. This compares with $7,737,954 for the 53 weeks ended Dec. 31, 1927, or 49c. a share on the common, figured on the above basis.

Hawaiian Pineapple—The Hawaiian Pineapple Company, Limited, reports for the year 1928 net income of $2,363,751 after depreciation, federal taxes and other charges, equal to $3.79 a share on 622,716 shares of stock. This compares with $1,334,701, or $2.68 a share on 497,513 shares in 1927. Current assets at the close of 1928 totaled $5,455,997 and current liabilities $595,472, compared with $7,170,610 and $2,820,960, respectively, at the end of 1927.

Godchaux Sugars, Inc. — Godchaux Sugars, Inc., reports net profits for the year ended Dec. 31, 1928, of $1,541,000, before interest, as compared with $475,698 for 1927. Current assets are reported as $3,044,193 and current liabilities as $596,158. Net profits for the first six months of the fiscal year, as of Dec. 31, 1928, amounted to $731,697, after interest, as compared with $34,238 in the corresponding period the previous year. The increase in profits is attributed to the improved yield obtained from the new sugar cane of Proofstation Oost Java, sponsored by the Department of Agriculture.

Continental Baking Corporation — The Continental Baking Corporation and subsidiaries for the 52 weeks ended Dec. 29, 1928, show net profit of $5,273,302 after interest, depreciation, federal taxes, preferred dividends of subsidiaries and other charges, equivalent after 8 per cent preferred dividends to $4.14 a share earned on 291,813 no-par shares of Class A common. This compares with net profit of $5,569,559 for 53 weeks ended Dec. 31, 1927, or $5.08 a share, on the Class A common.

Ward Baking Corporation — The Ward Baking Corporation and subsidiaries report for the 52 weeks ended Dec. 29, 1928, a net profit of $3,293,542 after interest, depreciation and federal taxes, equivalent after preferred dividends, to $8.71 a share earned on 86,275 shares of no par Class A and B common stocks. This compares with $4,231,895, or $10.32 a share on the Class A and $2.32 a share on the Class B common, for the 53 weeks ended Dec. 31, 1927. After Class A receives noncumulative dividends of $8 a year it shares equally with Class B stock in any further distributions.

Fleischmann Company—The Fleischmann Company reports for the fourth quarter of 1928 consolidated net profit of $5,216,120 after depreciation, federal taxes and other charges, equal after preferred dividends to $1.16 a share on the common. This compares with net income of $4,956,237, or $1.10 a share, in the corresponding quarter of 1927. Net sales totaled $15,682,267 for the period, against $15,915,007 in the same period of the preceding year. Net income for the full year 1928 was $19,820,668, or $4.39 a share, on the common, against $19,423,595, or $4.30 a share, in 1928. Net sales for 1928 totaled $64,004,366, comparing with $64,668,137 in 1927.

Coca-Cola Company—The Coca-Cola Company reports its net profit for 1928, after interest, federal taxes and reserves, as $10,189,120. This was equivalent to $10.09 a share on 1,000,000 no-par shares of stock. It compares with $9,163,155, or $9.16 a share, in 1927. Net income for the quarter ended on Dec. 31 last was $2,505,602 before taxes, or $2.50 a share, compared with $3,915,677 or $3.91 a share for the previous quarter, and $2,138,813, or $2.13 a share, for the last quarter of 1927.

International Salt Company—The International Salt Company for the six months ended Dec. 31, 1928, shows consolidated profit of $344,477 after charges but before taxes, equivalent to $5.66 a share earned on 60,771 shares. This compares with $118,457, or $1.96 a share, in the corresponding period in 1927.

American Chicle — The American Chicle Company reports for the year 1928 net profit of $2,032,572 after providing for all expenses and reserves, except income taxes. This compares with net profit for 1927 of $1,738,636. After provisions for taxes the net profit for 1928 was $1,795,268, compared with $1,524,002 in 1927. These earnings, computed by the company on 435,389 shares outstanding after an increase that was effected Jan. 21, 1929, were equal to $4.12 a share, while the 1927 earnings, on the same basis, were equal to $3.50 a share. Surplus account was increased last year by $1,099,490 and amounted on Dec. 31 to $2,847,442.

Purity Bakeries—The report of the Purity Bakeries Corporation and subsidiaries for the year ended Dec. 29, 1928, shows a net income of $4,815,955 after interest, depreciation, federal taxes and other charges, equivalent, after dividend requirements on the new $6 preferred stock, to $6.58 a share on 726,753 no-par common shares outstanding during virtually all of last year. Stock subscription rights expiring on Dec. 28 increased the common stock issue by 72,342 shares, which were outstanding only one day. On the increased stock of 799,095 shares, the year's earnings were equivalent to $5.99 a share. In the preceding year the net income was $3,107,401, or $4.50 a share on 421,642 shares of no-par common stock, the equivalent of class B stock then outstanding. For the twelve weeks ended on Dec. 29, the net income was $1,631,323, equivalent to $2.23 a share on 726,753 shares, or to $2.03 a share on 799,095 shares. Net income in the corresponding period of the previous year was $795,178, or $1.23 a share on the equivalent of 421,642 common shares then outstanding.

White Rock Mineral Springs—The White Rock Mineral Springs Company reports for the year 1928 net income of $1,150,214 after federal taxes and charges, equal after first preferred 7 per cent dividends to $20.20 a share on 10,000 shares of second preferred stock, and $4.04 a share on 200,000 shares of no-par common stock. This compares with $1,063,678, or $18.66 a share on the second preferred and $3.73 a share on the common in 1927.

American Chicle to Retire Preferred Shares

Notice of rights to subscribe to new shares of common stock at $40 each on the basis of one share for six shares held has been sent to stockholders of American Chicle Company. Proceeds of the sale will be used to retire $3,214,275 of 7 per cent cumulative preferred stock, which will result in an annual saving to the company of about 50c. a share on the 435,389 common shares to be outstanding.

Big Gain in Chocolate Use

Chocolate led the list of materials sold by confectioners in the United States in 1927, according to a report of the Department of Commerce. The amount, 375,000,000 lb., valued at $126,000,000, was of greater value than all the chocolate produced in the world 25 years ago.

Conflicting Opinions Disclosed at Tariff Hearings

Sugar and Agricultural Products and Provisions Likely to Be Affected by the Smoot-Hawley Bill

By Paul Wooton
Washington Correspondent

Conceding the likelihood of a general increase in the rates of duty prescribed for agricultural products, and assuming that many agricultural products now on the free list will be made dutiable, there is no reason to believe that the rates asked by those who have appeared on behalf of the farm organizations will be approved by Congress. In fact, some of the majority leaders in Congress are highly resentful because of the high rates requested. Some feel that the farm organizations have taken advantage of the situation to ask for "the world with a fence around it."

The fact that the Payne-Aldrich tariff caused disaster to overtake the Republican party has not been overlooked. Leaders of the majority party in Congress are using the full weight of their influence to hold increases to much lower levels than those requested. In addition, they are trying to confine tariff revision to the agricultural industry, and to those industries which are in actual distress as a result of foreign competition. For that reason the ways and means committee is going to unusual lengths in its efforts to ascertain the profits of domestic manufactures and in analyzing the import trade.

Sugar Suffering From Over-Production

Cane and beet sugar interests put up a united front in urging upward revision of the sugar tariff. The principal request contemplates raising to $2.40 the present duty of $1.76 per 100 lb. on Cuban sugar. Dutiable imports from other countries, which are almost nil, would pay $3, Cuba receiving a 20 per cent preferential under the reciprocal trade agreement. The purpose of this request is to relieve United States producers from direct competition with a glutted and depressed world market.

Overproduction has resulted from the rapid growth of the cane sugar industry in the Pacific islands, expecially Java. According to C. D. Kemper, who spoke for Louisiana growers, Java has been selling in Europe at prices below those east of Suez. Thus Cuba is shut off from part of the European market and is, in effect, dumping the surplus into the United States. The shipment of Javan sugar to this country is said to be under consideration.

A variant version of the economic situation was given by H. A. Lakin, who defended Cuba on behalf of American investors. Mr. Lakin blamed the low ebb in sugar prices to underbidding by Philippine concerns, testifying that a little cheap sugar can break the market. Cuban production has kept on an even level, he pointed out, and should not be charged with having caused the glut. Representatives of producers in the Philippines, Porto Rico, and Hawaii are claiming now, as they did in 1922, that they have reached their full capacity, but, Mr. Lakin stated, the sugar output of these islands has doubled since 1922, and there is no assurance that it is yet at its maximum. As to competitive labor costs, which were viewed with the usual protectionist alarm, Mr. Lakin denied that unit wages were materially lower in Cuba than in other sugar-producing countries. He contended that the duty should be lowered rather than raised.

Witnesses for United States growers of cane expressed fears that the Cuban price, now at only 2c. per pound, would fall still lower—to 1½c. or even 1c. This would not only ruin the industry in this country, they declared, but would throw large areas into the cultivation of other products, such as grains, of which there is already a surplus.

That domestic price advances arising from higher duties would not be unreasonable was shown by the fact that although the general prices index has risen 40 per cent since 1914, sugar is about at its pre-war level. If sugar sells at the fair rate of 6c. per pound, the beet sugar men argued, the price of beets will go above the present $7 per ton (which is at, or below, cost), without placing undue burden on the consuming public. A sliding tariff scale to maintain this level was proposed by certain of the beet interests, with an alternative plan of raising all sugar tariff rates 1c. per pound.

Evidence was cited to the effect that the entire domestic demand could be satisfied by beet sugar grown within the United States. The cane growers claimed they could expand to as much as two to three million tons a year under adequate protection.

The American Farm Bureau Federation supported the proposed 3-cent duty.

Candy Makers Believe Present Tariff Adequate

The National Confectioners' Association objects to the proposed sugar duty, claiming that it will be a blow to the candy industry. The average candy prices are low, it was shown, expensive boxed candy making up only a tenth of the total production. Because of brisk competition, profits are small, as proved by the fact that in 1927 half the manufacturers were unable to show taxable net profits. Figures were cited to show that the present tariff gives adequate protection and allows the beet industry to expand and pay high dividends. Our present annual sugar consumption is about six million tons, of which Cuba furnishes about one-half, American beets one million tons, and Hawaii nearly as much. Porto Rico, the Philippines, and American cane make up the remainder.

The confectioners asked that the present rate of 40 per cent ad valorem on sugar candy be raised to 50 per cent, on the grounds of increasing importations. A number of importers, however, point out that the imports of sugar candies make up only one-fifth of one per cent of American confectionery production. They ask that the duty be lowered to 25 per cent, as imported candy cannot compete in price and is sold to meet a special demand.

Blackstrap Molasses and Industrial Alcohol

A tangle of economic factors as far-reaching as is the case with sugar was presented by blackstrap molasses. Corn feels the pressure, as well as cane, in that cheap Cuban blackstrap has replaced corn as the chief source of industrial alcohol in this country. A flaw in the tariff act makes this possible. When molasses is less than 52 per cent total sugars, the duty is only ⅛c. per gallon, hardly enough to pay the costs of collection. Naturally, the importers dilute the incoming product below this concentration and receive it at the minimum rate.

The re-rate urged by Mr. Kemper, speaking for the cane growers, is 4c. per gallon up to 48 per cent total sugars, plus 1/12c. additional for each additional per cent up to 56. This applies to blackstrap not intended for the extraction of sugar or human consumption.

The sliding scale presumably eliminates watering by making it unprofitable. Mr. Kemper's proposal is aimed at this practice as well as toward the promotion of better conditions in the cane sugar industry.

Representatives of corn growers testified that, by taking over the industrial alcohol field, blackstrap has shut off a market for 35 million bushels of corn, or more than the amount exported. Molasses, rather than prohibition, closed the Peoria distilleries, they argued. Low-grade grain formerly used for alcohol has few purchasers, and the price of corn remains far below the general index. It was claimed that the 4c. duty on blackstrap would enable corn to regain the field.

The yeast industry wants blackstrap for yeast, vinegar, or cattle feed to be placed on the free list. Sugar beet growers were silent, as their molasses is not used for alcohol, it being taken up almost entirely in yeast manufacture, wherein cane blackstrap offers little competition.

On maple products the Cary Maple Sugar Company and others ask that the present uniform rate of 4c. per lb. be increased to 6c. on sirup and 9c. on

sugar. The difference is to encourage the processing of Canadian sirup on this side of the boundary line.

To protect dextrose and other corn derivatives, the Associated Corn Product Manufacturers want tariff increases corresponding to any upward revision on corn. It was pointed out that the manufacture of the products of corn, including starches, dextrins, and oils, takes 85 million bushels of corn annually, or one-third of the receipts at primary markets. This represents an increase of 70 per cent since 1913.

Animal Products, Grains, Fruits and Vegetables

As the hearings on Schedule 7, "Agricultural Products and Provisions," ran through five crowded days before the ways and means committee, hundreds of witnesses appeared to urge increased duties for the whole range of agricultural commodities. In accordance with the generally expressed idea that the new tariff bill is to be principally a farm relief measure, the main plea was for protection on raw materials equal to that enjoyed by the American manufacturer on his processed articles. It was pointed out by L. J. Taber, of the National Grange, that the average duty on manufactured goods is equivalent to an ad valorem of 40 per cent, whereas that on agricultural products, excluding the free list, is only 20 per cent.

The principal foodstuffs and related items that are up for revision in the forthcoming Smoot-Hawley Bill are outlined by the Washington representative of the American Farm Bureau Federation, Chester H. Gray, as here given. Mr. Gray has spoken on many subjects during the course of the hearings. More than once committee members have seen fit to compliment the fairness of his requests. Although some proposals differ from his tabulation, the following may be taken as the consensus of a large part of the farming industry. Duties are per pound unless otherwise indicated.

1. Live stock and meats: stockers and feeders, 3c.; beef cattle, 4c.; sheep and goats, $3 per head; swine, 3c.; fresh or frozen beef and veal, 8c.; fresh pork, 5c.

2. Dairy products: fresh milk, 8c. per gallon, but not less than 40 per cent ad valorem; butter, oleomargarine, and butter substitutes, 15c., but not less than 45 per cent; cheese and substitutes: (a) American type, 8c. (b) Swiss type, 12c., with both not less than 40 per cent.

3. Poultry, 10c.; eggs, 10c. per dozen.

4. Grains: corn, 30c. per bushel; barley, 24c. per bushel; oats, 16c. per bushel; rye, 30c. per bushel; wheat, 42c. per bushel.

5. Fruits: peaches, pears, plums, prunes, and prunellas—(a) green, ripe, or in brine, 1c.; (b) dried, 2c. Currants and raisins: (a) 4c.; (b) manufacturing type (maraschino), 8c. unstemmed, and 12c. stemmed. Lemons and limes, 2½c.; oranges and grapefruits, 2c.; apples 25c. per bushel.

6. Vegetables: beans and peas, 2c. green, 3½c. dried; onions, 2½c.; potatoes, 1c., but not less than 50 per ad valorem; tomatoes: raw 3c., paste and all others, 60 per cent.

7. Nuts: peanuts—(a) unshelled, 6c.; (b) shelled, 7c.; (c) blanched, 9c.; walnuts: (a) 6c., (b) 15c.; almonds: (a) 6¼c. (b) 19c.; filberts: (a) 4c. (b) 10c.

8. Seeds: cotton-seed, 2c.; soya beans, 2c.; flaxseed, 1½c., but not less than 45 per cent ad valorem.

The plea of the cattle and meat-packing interests is that, with the passing of the open ranges and other transitions, their costs have increased, while at the same time large South American cattle areas have been developed and compete by use of the cheapest peon labor. The American industry is temporarily on its feet because of the embargo on Argentine beef. Prices are up for this reason and also owing to a shortage of American stock, caused in part by the fact that certain areas were closed off to eradicate the hoof-and-mouth disease and are not yet back in production. So long as the embargo is on, no tariff increase is necessary, but, it is pointed out, stock raisers hesitate to increase their herds, and banks are loath to consider lending money in view of the fact that the barrier might suddenly be lifted. A tariff wall which will act regardless of the embargo is urged as a means of stimulating the industry into healthy activity.

The proposed rates would be prohibitive, according to Roy M. Cohen, of New York, who spoke for chain stores and wholesalers. He brought out that imports of meats in 1928 made up less than 1 per cent of the domestic supply and that prices were as bad as during the meatless days of the War. American people are naturally beef eaters, he stated. Only when they are deprived of it by high prices do they turn to other meats. Faddism in diet has not affected the situation, Mr. Cohen declared, saying that prosperous communities eat as much beef as ever, while those less fortunate must do without.

Bananas and Coffee

Pleas for a duty on bananas were officially entered by interested groups, one suggestion calling for a toll of 1½c. per pound. Chester H. Grey, on behalf of the American Farm Bureau Federation, put bananas at the head of a list of items now duty-free which should be transferred to the dutiable list, the contention of his organization being for a tariff of 75c. per bunch. In Mr. Grey's opinion, the principal reasons for taking bananas from the free list is to replace revenue which will be lost because of the decrease in the imports of dutiable farm products, when the higher rates of the new tariff apply. He expressed the hope that an increased price of bananas, which he expects to result, would tend to discourage their use in favor of American-made cereals and American-grown fruits.

That the ways and means committee was not in complete accord with the farm bureau's recommendation in regard to bananas was indicated clearly. One member pointed out that nothing could be made dutiable, on the ground that it would raise the price and thereby limit its use in favor of a substitute. Others raised the point that a tariff for revenue is contrary to the policy of the dominant political party.

Coffee producers from Hawaii and Porto Rico appeared on behalf of United States insular possessions asking a duty of 5c. per pound, in order to defeat the Brazilian defense plan and to build up a high-grade coffee industry under the American flag. Hon. F. C. Davila, of Porto Rico, pointed out that his countrymen represent the most profitable market among all the island territories and asked trade reciprocity in the form of a tariff to protect the Porto Rico coffee plantations. It was stated that little price increase would reflect back to the American public.

The vegetable growers are concerned principally with imports from Mexico and the West Indies. Importations of green peas, for example, have increased from eight carloads four years ago to more than 1,000 carloads in 1928. Tomatoes, eggplant, green peppers, and many other vegetables are also coming in on a large scale. Italian tomato paste is invading the New York market to the extent of sixteen million pounds annually, it is claimed by J. S. Mitchell, speaking for the National Canners' Association.

Labeling Substandard Goods

The bill to require labeling of substandard canned goods is making rapid progress, having been approved by the Senate and House committees on agriculture and placed on the calendar. Chances for its early passage are considered very favorable. It will be recalled that the bill is a proposed amendment to the basic Food and Drugs Act and is applicable to all canned foods except meats, meat products, and milk, which existing laws cover. The purpose is not to set up classified standards but to lay down a minimum requirement below which goods must be labeled as what they are.

Discussion of the bill, which has been before Congress for two sessions, has done much to arouse the public to the existence of low-grade canned goods. This seems to have had a marked effect on the housewife, who now is assuring herself of the quality of canned goods before she buys.

In 1928 important forward steps were made in the installment of the many recent improvements in canning machinery. This, together with the tendency of the industry to install more careful and systematic business methods, is resulting in lower costs, and in the improvement of products, which, with the more general realization that production must be kept in step with the rate of consumption, have contributed to the improved condition in which the industry finds itself.

Technical Notes from the Canners' Chicago Convention

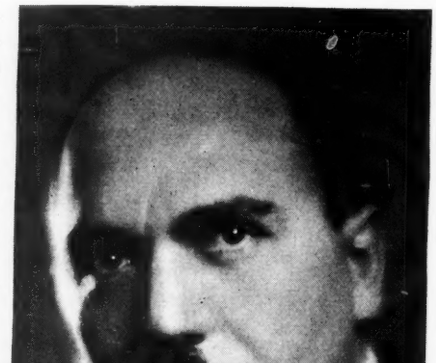
DR. E. J. CAMERON, of the research laboratories of the association, discussed the bacterial flora of sugar and salt, at the Chicago convention of the National Canners' Association last month. His remarks indicated the need for continued study of both of these substances as possible sources of undesirable bacterial flora in meat curing. The work of James (*Food Industries*, November, 1928) and himself (*Centralblatt für Bakteriologie*, vol. 76, p. 28, 1928) on the bacterial flora of sugar and its relation to spoilage organisms was reviewed. He pointed out that much less is known about the bacterial flora of salt from various sources than about sugar, and that still less is known about its significance. The curing of codfish and its occasional red discoloration have been studied by Bitting (Bulletin 133, U. S. Department of Agriculture, 1911), and by Harrison and Kennedy (Report No. 11, Advisory Council for Scientific and Industrial Research, Canada). James has found a red discoloration of hides in preparation for tanning that is associated with bacteria from the salt used in the process, as disclosed in an address given before the Washington Branch of the Society of American Bacteriologists in December, 1928. Sturges and Parsons, of the Cudahy Packing Company, have made a few observations on the bacteria on salt as a source of putrefactive anaerobic bacteria (*Journal Bacteriology*, 1926.) The lack of further knowledge is suggestive of the desirability of additional study as a means of eliminating one possible source of objectionable contamination.

Nitrites Restrain Bacterial Growth in Meat Pickling

The specific effects of salt, nitrate, and nitrite in inhibiting the growth of putrefactive anaerobic bacteria was discussed by Dr. C. R. Moulton, of the Institute of American Meat Packers. Salt and sodium nitrate or nitrite are used in the curing of meats. When so used, the nitrate is reduced to nitrite and then takes part in the fixing of the color in cured ham or bacon, or corned or dried beef. Dr. Moulton cited the results of experiments which indicate that nitrite *alone* is 40 times as potent in preventing the growth of bacteria of harmful types in meat pickle as nitrate plus 5 per cent salt. He suggested that these curing agents may also prevent the growth and toxin production of *Clostridium botulinum*.

Heat Penetration Studies on Canned Meats

The meat canners have been interested recently in the application of the newest knowledge of the rate of heat penetration to their own industry. Within the last year R. J. Thompson, of the research laboratory of the canners association, has made tests on a variety of canned meats, and his address in part described his findings. He has found that the principles governing the heating rate of vegetables are applicable to the heating of canned meat. The greater variety of can sizes found in this field, and the wide range of products packed, make it imperative to continue these investigations, if meat canning is to be placed on a sound technological basis. His studies included ox-tongue, lunch tongue, Vienna sausage, sausage meat, potted meat and brains.



Edward B. Cosgrove

The new president of the National Canners' Association is Edward B. Cosgrove, better known as "Ward" Cosgrove, president of the Minnesota Valley Canning Company, Le Sueur, Minn.

How Whole Kernel Corn Is Packed

One of the few technical addresses made at the convention by men other than members of the technical staffs of one of the large research organizations was that of Charles Meister, of the Fairmount Canning Company, Fairmount, Minn., who described the packing of whole grain corn. Mr. Meister detailed the operations purely within the realm of corn canning, such as seed selection, husking, washing, and inspection. Corn that is at the right stage of maturity for this method of canning is too young for cutting from the cobs until the starch has been set by a mild cooking at 170 deg. F. for 4½ min. A higher temperature such as 200 deg. F. will toughen the hulls. After the blanching operation the corn is cooled in order to assure a clean cut by the rotary knives.

The cut corn is washed and screened to remove adhering corn silks, and is run over an inspection belt, where discolored kernels are removed. Finally, a bath with hot water gives it an initial temperature before mixing with brine that will make the resultant temperature high enough for satisfactory canning. The brine consisted of 30 lb. of sugar and 10 lb. of salt to 100 gal. of water.

A feature of considerable importance is that the canning process must be kept going continuously to preserve good color or flavor. The contact of the product with air must be minimized.

The packing of whole grain corn is an experiment with many concerns. Although its reception by the public has been good, it involves a method of packing that is much more expensive than the older system of packing crushed corn. Mr. Meister felt that he was justified in passing out the results of his experience, so that others would be enabled the better to pack whole kernel corn of high quality—a condition that is necessary if the reputation of the product and the esteem of the public are to be maintained by this new development.

Reducing the Number of Sizes of Peas

Dan F. Gerber, of the Fremont Canning Company, Fremont, Mich., described his personal experiences in determining the consumer preference for particular sizes of canned peas as contrasted with fresh peas, which are, of course, ungraded for size. He found that the fancy, canned, ungraded, sweet variety of pea was preferred to fresh peas out of season, and from his observation he concluded that the production man had gone too far in his refinements by sifting out five or six sizes of peas. The composite flavor of ungraded peas had a much greater appeal than the flavors corresponding with individual siftings.

It appears that a tendency toward simplification is warranted. Mr. Gerber's company has reduced its siftings of Alaska peas from five to three, and is putting up ungraded Sweets.

Informative Discussions

AT the convention of 1928 the Meat Section of the National Canners' Association was formed. It was an important forward step. We present 1929 reports of the first year's studies of the technical problems of meat canning under the new arrangements. Although the researches on meat canning are years behind the work on fruits and vegetables, they will have the benefit of the prior experience and should yield results to the industry quickly

Society of Bakery Engineers in Session at San Francisco

OVER five hundred registered at a junior national convention of the American Society of Bakery Engineers held at the Clift Hotel, San Francisco, Jan. 21-24. The regular annual convention will take place in Chicago in March. The society is composed of the leading bakery production managers of the country.

J. M. Alexander, of Los Angeles, discussed manufacturing costs in detail. In the discussion that followed, much of the time was devoted to definitions of the several cost items and methods of handling the figures. On the subject of relationship of manufacturing cost to selling price, it was stated that 67 per cent was a good figure, giving 6 per cent return on the investment.

The address by President Tassie was an exceptionally clear analysis of the needs of a bakery organization and the set-up that would best fulfill the purpose. Mr. Tassie showed how he rated the superintendent by a scoring system, and stressed the importance of the human element as a factor in any organization, believing that a production manager must be a keen student of human nature. His rule is to give all applicants due consideration and courteous treatment, holding that it builds up good will, and that, furthermore, it is good advertising. The basic fundamentals of a good organization were stated to be a cheerful modern plant, a decent wage, and considerate treatment of employees.

An interesting feature of his address was a chart illustrating his idea of the proper form of bake shop organization with authority so delegated as to produce the best results.

In the discussion of the paper by N. M. Cregor, of Los Angeles, on the subject of water and yeast food, the question of sulphur in the water was raised. It was pointed out that comparable results might be obtained with flour that had been fumigated by sulphur dioxide. Mr. Cregor stated that if the sulphur were present as hydrogen sulphide the water would have a bad odor and would exert a disintegrating action on the gluten. Mr. Cramer, of San Diego, reported similar results from sulphured raisins and walnuts, when they are added to the doughs in customary fashion.

Alkali in water was reported by Mr. Wood, of Grass Valley, Calif., to be offset by the use of 3 per cent of salt.

In discussing fuels, P. M. Pirrie, of New York, showed that the thermal efficiencies of the more common sources of heat in the bake shop were as follows: electricity 76.5 per cent; gas, 47.5 per cent; oil 16.5 per cent; coal 15.6 per cent.

A recent development in the production of sweet dough products is the use of refrigeration. The dough is given the proper fermentation and then placed in a refrigerator for varying periods of time, depending on the type of product desired.

To Dissolve United Biscuit Company

Dissolution of the old United Biscuit Company will be voted upon at the stockholders' meeting in Chicago on Feb. 28. It will be remembered that in 1927 the business and properties of this company were sold to the United Biscuit Company of America. The old company owns 165,000 common shares of the latter and is merely a holding company. K. F. MacClellan, of Chicago, president of both companies, proposes the following plan of distribution:

Class A shareholders of the old common stock would receive the regular dividend of $1 a share at that time, and, in addition, one and one-half shares of United Biscuit of America for each share of United Biscuit. As there are 65,000 shares of the Class A shares of the old company outstanding, it would require 97,500 shares of the new company—of the total of the 165,000 shares now owned—to satisfy the Class A shareholders under this plan.

The remaining 67,500 shares of the new company would be distributed among the holders of Class B stock of the old company. Of this stock 100,000 shares are outstanding on the basis of two shares in the new company for three of Class B of the old.

Dr. J. J. Willaman to Head Department at Geneva Station

Dr. John J. Willaman, professor of plant chemistry at the University of Minnesota, has been named head of the chemistry division at the New York Agricultural Experiment Station at Geneva, N. Y. Dr. Willaman succeeds Dr. L. L. Van Slyke, who has retired after directing the chemical work at the station for the last thirty-eight years. He will enter on his new duties about April 1.

Dr. Willaman has made many contributions to industrial chemistry, particularly in respect of those industries utilizing agricultural products. Chief among these is the scientific control of sorghum sirup manufacture. At the time he began his work on this problem at the Minnesota Experiment Station, sorghum sirup was not manufactured anywhere on a large scale, and all the plants manufacturing it produced an inferior article. His activities have led to the establishment of a large sorghum sirup factory in Minnesota and another —still larger—at Cedar Rapids, Iowa.

Pin Money Products, Inc.

Announcement is made of the change of the corporate name of Mrs. E. G. Kidd, Inc., to Pin Money Products, Inc. No change of ownership or management will take place.

Corn Products Plant at Sao Paulo, Brazil

A large plant for the manufacture of corn products, financed by American capital, has been under construction since Dec. 1, according to W. G. McCreery, U. S. Trade Commissioner at Sao Paulo. The plant is to handle 2,000 bu. of corn a day, with provisions for an increase of capacity to 8,000 bushels.

Reorganization of Acme Preserve Company

Acme Preserve Company, of Adrian, Mich., has been reorganized with W. H. Burham, president; Frank W. Prentice, vice-president; Earl G. Kuney, treasurer; and W. Herman Mathes, secretary. The last two named have acquired the interest of E. P. Lake, formerly president of the company.

Spreckels Sugar Corporation to Take Over Federal

Formation of the Spreckels Sugar Corporation to take over the Federal Sugar Refining Company was announced recently by Rudolf Spreckels. The new corporation will have $20,000,000 preferred stock of $100 par value and 330,000 shares of common stock without par value. According to the latest financial statement available, the Federal company is capitalized at $16,707,000 common and $3,292,100 of 6 per cent preferred, of which $12,913,100 common and $1,929,300 preferred is outstanding. The Oct. 31, 1924, statement, which is the latest available, shows a deficit of $2,730,991.

The new Spreckels Sugar Corporation is not to be confused with the Spreckels Sugar Company of San Francisco, one-half of whose stock is owned by the American Sugar Refining Company.

Liquid Carbonic Grows

The sale of eight plants of the General Carbonic Company and all its assets to the Liquid Carbonic Corporation has been concluded. This now gives the latter 26 plants. It will be recalled that Liquid Carbonic recently purchased the O. & J. Machine Company, of Worcester, Mass., manufacturers of the O. & J. labeler and the O. & J. crowner.

General Mills and Sperry Flour Merger

Negotiations for the acquisition of the Sperry Flour Company, of San Francisco, by General Mills, Inc., have been completed, according to the announcement of James F. Bell, president of the latter. The proposed merger is subject to the approval of two-thirds of the Sperry stockholders. Upon completion of the transfer, General Mills will have a flour-milling capacity of 87,700 bbl. daily in its 21 mills, and 30,463,000 bu. of grain storage in terminal elevators, as well as in 219 country elevators.

Payment will be made by retiring the outstanding Sperry 6-per-cent bonds at 107, and the Sperry preferred stock on April 1, at 105; and by delivery to the Sperry company of 27,000 shares of General Mills 6-per-cent cumulative preferred stock, and 31,765 no-par shares of common stock.

Wesson Oil & Snowdrift Company Issues New Stock

Wesson Oil & Snowdrift Company, Inc., owner of the Southern Cotton Oil Company, Southport Mill, Ltd., and Sco Tank Line, Inc., refiner of approximately 16 per cent of all the cottonseed oil produced in the United States, are issuing 400,000 shares of convertible preferred stock without par value, proceeds of the sale of which are to be used to retire the entire issue of $7 cumulative preferred stock, of which 142,114 shares are outstanding, and to provide additional working capital. The new stock is entitled to receive cumulative dividends at the rate of $4 per share per annum. The 1929 price range on the New York Exchange of the present preferred shares is $106½ to $112.

Vegetables Canned Especially for Babies

Unseasoned strained vegetables are being canned by the Gerber Products Division of the Fremont Canning Company of Fremont, Mich. The line, consisting of unseasoned strained peas, carrots, spinach and prunes in 4½-oz. tins, and vegetable soup in 10¼-oz. tins, is intended as a supplement to the milk diet of infants.

"The Story of Evaporated Milk"

The Evaporated Milk Association, of 231 South La Salle St., Chicago, has published an illustrated 32-page booklet, entitled, "The Story of Evaporated Milk," explaining in popular language the process of manufacture, and describing the uses of evaporated milk. The booklet is for free distribution upon request.

Life Savers Merges With Drug House

At a meeting on Dec. 31, 1928, stockholders of Life Savers, Inc., of Port Chester, N. Y., voted to approve the proposed merger of this company with Drug, Inc. The 550,000 shares of Life Savers, Inc., will be exchanged for 146,521 shares of Drug stock, which, according to newspaper reports, has a market value of $115 a share and indicates a purchase price of approximately $17,000,000.

A Canadian corporation, Life Savers, Ltd., is to be formed to take over the Canadian business, and shares will be distributed to holders of Life Savers shares on the basis of one share for each ten shares held.

Dahlberg Corporation of America

B. G. Dahlberg, of Chicago, president of the Celotex Company and the Southern Sugar Company, has organized the $11,000,000 Dahlberg Corporation of America, of which $1,000,000 has been paid in. The investment trust company will invest in the Celotex company and other Dahlberg interests.

PERSONALS

CARLE C. CONWAY, president of the Continental Can Company, has been elected a director of the Skelly Oil Company.

EDGAR H. BRISTOL, president of the Foxboro Company, Foxboro, Mass., sailed from New York on Jan. 31 for an extensive trip through South America.

IRA E. TRANTER has resigned from the Morgan County Packing Company, of Alabama, and is now factory manager of the Franklin Food Products Company, of Franklin, Ind.

S. G. GORSLINE, of the research division of the American Can Company, has been elected Scout Commissioner of the city of Chicago. In this position he heads an organization of 15,000 boy scouts.

C. M. TYLOR has been appointed sales manager of the Lincoln Electric Company, Cleveland, Ohio. He has been factory manager since 1923, and in 1925 was elected vice-president of the company.

J. C. MCNULTY, SR., has joined the Postum Company and is in charge of the office at 88 Front Street, New York, for the purchase and testing of coffee for the Maxwell House brand.

DR. E. D. CLARK, of Seattle, Wash., sailed by the "Mauretania" on Feb. 15 for an extended trip to Europe to investigate market conditions and possible new outlets for canned salmon. He was accompanied by Mrs. Clark.

FRED H. SPRAGUE is now associated with George B. Burke, vice-president of Sarco Company, Inc., Chicago. Mr. Sprague will act as sales manager of Sarco Company's newly created western heating division, with headquarters in the Engineering Building.

G. WINKELMANN, who, until quite recently, has been in charge of manufacturing operations of the Richard Hellmann, Inc., division of the Postum Company, is now general superintendent of production of both Hellmann's mayonnaise and Maxwell House coffee.

WILLIAM RABAK has been placed in charge of the analytical department of the technical bureau of the Biscuit and Cracker Manufacturers Association at Dunwoody Institute, Minneapolis. Mr. Rabak resigned from the U. S. Bureau of Chemistry to take up this new work.

R. VAN BENSCHOTEN has been elected president and director of the Horton-Cato Manufacturing Company, a Detroit subsidiary of Royal Baking Powder, manufacturing mayonnaise, salad dressing, and mint sauce. Before joining the Horton-Cato company, about two years ago, Mr. van Benschoten was vice-president and general manager of Richard Hellmann, Inc., of Long Island City.

OBITUARY

GEORGE W. FIELD, manager of the beef department of Geo. A. Hormel and Company, Austin, Minn., died suddenly on Jan. 24 following a heart attack.

A. H. WHITENEY, vice-president of the Columbus Canning Company, and one of its organizers, died suddenly of heart failure on Jan. 23 at the age of 75.

ANDREW J. BLACK, 60, died Jan. 31 in the Orange Memorial Hospital at Orange, N. J. He was manager of the Higgins Ice Company, of East Orange, N. J.

GUSTAV J. LANGE, president of the Lange Canning Company, of Eau Claire, Wis., died suddenly in January. He was an important factor in Wisconsin pea canning.

EDMUND K. KAHN, of Avondale, Ohio, a member of the well-known family of Cincinnati meat packers, and an employee of E. Kahn's Sons Company, died at his home on Jan. 28.

GEORGE B. OLNEY, died Jan. 14 at his home in Westernville, N. Y. He was a partner of the firm of Olney and Floyd, who have been in the canning business for half a century.

FRANK T. MAJOR, 60, of Major Brothers Packing Company, Mishawaka, Ind., died Jan. 16. He had been failing for a long time, and had been a hospital patient for the last two years.

JOHN J. FELIN, president of John J. Felin, Inc., packer, of Philadelphia, and president of the Taylorville Packing Company, of Pleasantville, N. J., died of heart disease at Philadelphia on Jan. 18, in his sixty-sixth year.

JOHN L. WILLIAMS, of Elizabeth, N. J., president of the Prince Packing

Company, of Seattle, was killed by falling from a ninth floor window of the Times Square Hotel, New York, on Jan. 25. He had been ill for a week, and it is believed that he experienced a spell of dizziness when opening the window.

Dr. Osborne Passes

DR. THOMAS BURR OSBORNE, a chemist of international repute, died Jan. 29 at his home in New Haven, Conn. He was chemist of the Connecticut State Agricultural Experiment Station at New Haven, and is best known for his researches on proteins. He was a member of the National Academy of Sciences, an honorary and foreign member of the London Chemical Society, an associate member of the Société Royal des Sciences Medicales et Naturales de Bruxelles, an associate editor of the *Journal of Biological Chemistry*, a Fellow of the American Academy of Arts and Sciences, and in 1910 was president of the American Society of Biological Chemists. His death was due to acute heart disease, believed to have been induced by the shock of a recent burglary at his residence.

William Breining Ward Dies at His Desk

WILLIAM BREINING WARD, president of the Ward Baking Company of New York, died of heart disease in his office on Feb. 6, at the close of the day's work. Just before five o'clock, L. D. Haldimand, his secretary, with whom he motored to his home each evening, went into Mr. Ward's office to inform him he was ready to leave. Mr. Ward was sitting in his chair with his head lying on his desk. By the time physicians arrived he was dead. He was 45 years old and seemingly in excellent health.

The son of Robert Boyd Ward, the first president of the Ward Baking Company, Mr. Ward was a graduate of the Wharton School of Finance in Philadelphia. Entering business with his father in Pittsburgh in 1906, he served as representative of the Ward-Corby Baking Company in several New England cities. He was elected treasurer and a director of the Ward Bread Company, later to be known as the Ward Baking Company.

Mr. Ward became manager of the Ward company's Bronx plant, but resigned when it was incorporated with Ward Brothers, of Rochester, in 1912. He then organized the $10,000,000 United Bakeries Corporation, with plants in the Midde West and South. In 1924 he was elected president of the newly organized Ward Baking Corporation, which had acquired 99 per cent of the stock of the Ward Baking Company of New York. At this time he resigned as chairman of the United Bakeries Company.

His next activity was the preparation of a huge merger of the several Ward companies with the General, Continental, and United Baking Corporation, but in this he was stopped by the federal government by suits for violation of the Sherman Act and Clayton Act.

He leaves a widow, five children, and three brothers—Charles A., Howard B., and Robert B. Ward, Jr.,—all of New Rochelle, N. Y. Charles A. Ward is chairman of the board of the Ward Baking Corporation. An uncle, George S. Ward, of Havana, Cuba, and Pittsburgh, is a half-brother of the father of William B. Ward, and at one time was president of the baking company bearing his name.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Bakery—Brown's Bread Ltd., 462 Eastern Ave., Toronto, Ont., awarded contract for 1 and 3 story, 55 x 150 and 65 x 100 ft. additions to bakery on Eastern Ave. to J. Robert Page, 18 Toronto St., Toronto. Estimated cost $100,000.

Bakery — Continental Baking Co., 15th and Bryant Sts., San Francisco, Calif., awarded contract for the construction of a 2 story bakery at 15th and Bryant Sts. to MacDonald & Kahn, Financial Center Bldg., San Francisco. Estimated cost $200,000.

Bakery — Continental Baking Co., 2915 Grand River Ave., Detroit, Mich., awarded contract for a 2 story addition to bakery to G. A. Duke, 2500 Tuxedo Ave. Estimated cost $150,000.

Bakery—H. H. Edwards, Corpus Christi, Tex., plans the construction of a 1 story bakery. Estimated cost $25,000. Dielman & Levy, Corpus Christi, are architects.

Bakery—General Baking Co., 420 Lexington Ave., New York, N. Y., will soon award contract for the construction of a bakery at Worcester, Mass. Estimated cost $40,000. C. B. Comstock, 110 West 40th St., New York, N. Y., is architect.

Bakery—Koob Bakeries Co., 2823 Marcus Ave., St. Louis, Mo., is having plans prepared for a 1 and 2 story, 50 x 58 ft. bakery. Estimated cost $40,000. J. D. Paulus, 4729 Northland Ave., St. Louis, is architect.

Bakery — Mary Ann Baking Co., 4550 Palmer St., Chicago, Ill., awarded contract for the construction of a 1 story bakery at 4550 Palmer St. to Neff Construction Co., 4657 North Western Ave., Chicago. Estimated cost $75,000.

Bakery—Van de Kamp's Holland-Dutch Bakers Inc., c/o McCormick Co., 41 Park Row, New York, N. Y., Archt., is having sketches made for the construction of a 4 story bakery on Orange Dr., Los Angeles, Calif. Estimated cost $200,000.

Bakery Addition—Purity Bakeries Corp., M. Carpenter, 711 South 10th St., Newark, N. J., will receive bids about Mar. 1, for a 3 story addition to bakery. Estimated cost $40,000. R. H. Brown, 844 Rush St., Chicago, Ill., is architect.

Baking Equipment — Shulze Baking Co., 732 Howett St., Peoria, Ill., plans to purchase new baking equipment to include two rotary ovens, new doughnut machines, mixer, etc. for proposed 2 story bakery at 900 Lincoln Ave. Estimated cost $50,000.

Bottling Plant—Borden Farm Products Co., 326 West Madison St., Chicago, Ill., awarded contract for the construction of a bottling plant at 7301 Harrison St., Forest Park, Ill. to George Thomson & Sons, 30 North La Salle St., Chicago, Ill.

Bottling Plant—Coca-Cola Bottling Co., Morrilton, Ark., is having preliminary plans prepared for the construction of a 2 story bottling plant at Moore and Elm Sts. Estimated cost $75,000.

Bottling Plant — Colonial Beverage Co. Inc., 125 Brookline St., Cambridge, Mass., awarded contract for alterations and additions to bottling plant at 139-141 Hampshire St. to T. Mulcare Inc., 66 Western Ave., Brighton, Mass.

Bottling Plant Addition — Bacon Bottling Works, 43 Morris St., Hartford, Conn., plans addition to plant on Morris St. Estimated cost to exceed $40,000. Berenson & Moses, 252 Asylum St., Hartford, are architects.

Brewery — Carling Breweries Ltd., C. Burns, Mgr., London, Ont., plans the construction of a brewery at Winnipeg, Man. Estimated cost $300,000.

Candy Factory—Hoffman Candy Co., 634 South San Pedro St., Los Angeles, Calif., plans the construction of a 2 story, 75 x 220 ft. candy factory on Avalon Blvd. Estimated cost $100,000. C. F. Plummer, Storage Bldg., Los Angeles, is architect.

Cannery — California Canneries Co., 600 Minnesota St., San Francisco, Calif., awarded contract for the construction of three 1 story buildings for cannery at Minnesota and 18th Sts. to H. A. Klyce, 514 Call Bldg., San Francisco. Estimated cost $60,000.

Canning Plant — E. Clemens Horst Co., Wheatland, Calif., is having preliminary plans prepared for addition to plant for canning peaches, cherrys and apricots. Estimated cost $35,000. Machinery and equipment will be required.

Cheese Factory — Swift & Co., Packers and Exchange Aves., Chicago, Ill., awarded contract for a 1 story, 52 x 100 ft. cheese factory at Coguille, Ore., to Lackey & Moll, Broadbent, Ore.

Coffee Packing Plant — Hills Bros. Co., 2124 Sacramento St., San Francisco, Calif., awarded contract for a 2 story, 100 x 220 ft. coffee packing plant at Mateo and 6th Sts., Los Angeles to P. J. Walker Co., Garland Bldg., Los Angeles.

Cold Storage Plant—Apple Growers Cold Storage Co., Watsonville, Calif., awarded contract for a 1 story, 300 x 500 ft. cold storage plant to F. L. Hoyt, 343 East Reed St., San José. Estimated cost $250,000.

Cold Storage Plant — California State Harbor Commission, Ferry Bldg., San Francisco, Calif., is having surveys made for the construction of a cold storage plant. Estimated cost $2,000,000. F. G. White, Ferry Bldg., San Francisco, is engineer.

Cold Storage Plant — H. Doerr, 150 Shuttle Meadow Ave., New Britain, Conn., will soon award contract for a 2 story, 25 x 70 ft. cold storage plant, three units, at Spring and Hartford Sts. Estimated cost $40,000. L. J. Thompson, 586 Corbin Ave., New Britain, is architect.

Cold Storage Plant — Central Power & Light Co., F. C. Ludden, Dist. Mgr., San Benito, Tex., awarded contract for the con-

struction of a cold storage plant, 200 ton capacity at Elsa, Tex. to Sumner Sollitt Co., Frost Bldg., San Antonio. Estimated cost $42,000.

Cold Storage Warehouse — Gulf Coast Fish & Poultry Co., Bradenton, Fla., plans the construction of a cold storage warehouse. Estimated cost $15,000. Baker Ice Machine Co., Orlando, Fla., is engineer.

Cold Storage Plant — Salinas Valley Ice Co., 124 Soledad St., Salinas, Calif., plans the construction of a cold storage plant and packing sheds at Chualar. Estimated cost $1,000,000. Private plans.

Cold Storage Plant and Warehouse — Brickenwald Supply, P. E. Froehlick, Pres., 80 North 5th St., Portland, Ore., plans the construction of a cold storage plant and warehouse for butcher supply factory at 22nd and Quinby Sts. Architect not selected.

Cold Storage and Ice Plant — Central Atlantic States Service Corp., Harrisonburg, Va., plans the construction of a cold storage and ice plant.

Creamery—Golden State Milk Products Co., 425 Battery St., San Francisco, Calif., will build a 2 story creamery at Telegraph Ave. and 59th St., Oakland. Estimated cost $40,000. Work will be done by day labor.

Creamery — Southwest Dairy Products Co., c/o E. T. Laubscher, 300 Jones Ave., San Antonio, Tex., plans the construction of a creamery. Estimated cost $200,000.

Creamery—Swift & Co., U. S. Yards, Chicago, Ill., plans the construction of a creamery on Main St., Lexington, Ky. Estimated cost $100,000.

Creamery Plant — Traer Co-Operative Co., Traer, La., plans the construction of a creamery plant at Hereford, Tex. Estimated cost $65,000. Private plans. Machinery and equipment will be required.

Dairy Manufacturing Building—University of Kentucky, F. L. McVey, Pres., Lexington, Ky., will soon award contract for the construction of a dairy manufacturing building, etc. Estimated cost $150,000. Frankel & Curtis, Lexington, are architects.

Dairy Plant — Metzger Dairies, c/o C. Metzger, Dallas, Tex., will build a 1 and 2 story, 60 x 90 ft. dairy plant at 1430 North Flores St. Estimated cost $75,000. Private plans. Work will be done by day labor.

Dairy Plant — Producers Milk Co. Inc., J. H. Tull, Mgr., Linden Circle, Memphis, Tenn., awarded contract for a 2 story, 60 x 120 ft. dairy plant to include refrigeration equipment, power house, boiler room, etc. at South Bellevue and Beechwood Aves. to L. E. Joyner & Co., 163 South 3rd St., Memphis. Estimated cost $150,000.

Dairy Distribution Plant — California Dairies, Inc., Pasadena, Calif., had plans prepared for the construction of a 2 story, 80 x 160 ft. distribution plant. Morgan, Walls & Clements, Van Nuys Bldg., Los Angeles, Calif., are architects.

Dehydration Plant—M. F. Ward, Harlingen, Tex., is having preliminary plans prepared for the construction of a 2 story dehydration plant. Estimated cost $50,000. Private plans.

Dried Fruit Terminal, Refrigeration Plant—Dept. of Public Works, San Francisco, Calif., plans terminal facilities to include dried fruit terminal, refrigeration plant, etc. for State Harbor Commission. Estimated total cost $2,439,000.

Extract Factory — Sethness Co., 659 Hobbie St., Chicago, Ill., awarded contract for the construction of a 2 story, 147 x 200 ft. factory for the manufacture of flavoring extracts at Belle Plaine and Kilpatrick Aves. to Harman Engineering Co., 844 Rush St. Estimated cost $270,000.

Fish Canning Plant — F. E. Booth Co., 110 Market St., San Francisco, Calif., is having plans prepared for the construction of a fish canning plant at Pittsburg, Calif. Estimated cost to exceed $150,000.

Fish Storehouse—Great Atlantic & Pacific Tea Co., H. L. Treeman, Aukland St., Dorchester, Mass., will soon award contract for a 3 story fish storehouse at Northern Ave., South Boston. Estimated cost $150,000. M. Linenthal, 333 Washington St., Boston, is engineer.

Flour Mill Addition—Royal Milling Co., Ford Bldg., Great Falls, Mont., plans the construction of a 60 x 160 ft. addition to flour mill at 8th Ave. and North 26th St. Estimated cost $150,000.

Food Products Manufacturing Plant — O. K. Products Co., Allentown, Pa., plans the construction of a 3 story plant at 199-201 Magazine St. Estimated cost $40,000. Architect not announced.

Food Products Terminal — California Co-Operative Products Co., 13th and North B. Sts., Sacramento, Calif., plans the construction of a terminal including warehouses, transit sheds, etc. at Oakland. Estimated cost $1,000,000. Private plans.

Food Products Warehouse—Great Atlantic & Pacific Tea Co., Sherman Ave., Newark, N. J., plans the construction of a 4 story warehouse at Queen St., Newark, also a 4 story, 145 x 270 ft. warehouse at Montreal, Que. Estimated cost $150,000 and $400,000 respectively. Architect not selected.

Fruit Auction Shed and Dairy Products Plant — Nickel Plate Development Co., Terminal Tower, Cleveland, O., will soon award contract for a 1 and 2 story, 110 x 460 ft. fruit auction shed also taking bids for a 2 story, 50 x 130 ft. dairy products plant at East 37th St. and Croton Ave. Estimated cost $300,000 and $75,000 respectively. Wilbur Watson & Associates, 4614 Prospect Ave., Cleveland, are architects.

Grain Elevator—Tacoma Port Commission, Tacoma, Wash., has retained Cassaday Engineering & Construction Co., Seattle to prepare plans for the construction of a grain elevator. Estimated cost, $500,000.

Grain Elevator Addition — Goderich Elevator & Transit Co., G. L. Parsons, Mgr., Goderich, Ont., awarded contract for a 50 x 258 ft. addition to grain elevator to Metcalf & Co., c/o owner. Estimated cost $300,000. Complete new grain handling machinery will be installed.

Ice Cream Plant—Velvet Ice Cream Co., 2025 Fresno St., Fresno, Calif., awarded contract for the construction of a 2 story ice cream plant at Broadway and Sacramento St. to J. T. Cowan, 750 Elizabeth St., Fresno. Estimated cost $30,000.

Ice Cream Plant Addition — New York Eskimo Pie Co., 110 Bridge St., Brooklyn, N. Y., plans addition to ice cream plant.

Ice Plant—Fisher Churchill Co., Dedham, Mass., will soon award contract for the construction of an artificial ice plant. P. A. Hopkins, 45 Bromfield St., Boston, is engineer.

Ice Plant, etc.—J. P. Jones, St. Petersburg, Fla., plans the construction of an ice plant, meat storage building, ice tank, engine room, etc. Estimated cost $42,200. E. A. Nordstrom, St. Petersburg, is chief engineer.

Ice Plant — Knickerbocker Ice Co., 41 East 42nd St., New York, N. Y., awarded contract for the construction of an ice plant at Newark, N. J., to Waldemar Mortensen Inc., 103 Park Ave., New York, N. Y. Estimated cost $40,000.

Ice Plant—Kruman & Burnstein, c/o W. Clifford, Jr., 293 Morris Ave., Elizabeth, N. J., Archt., will receive bids about Mar. 1, for the construction of an ice plant at Elizabeth River and South 7th St. Estimated cost $50,000.

Ice Plant—Liquid Carbonic Corp., 3100 South Kedzie Ave., Chicago, Ill., awarded contract for a 2 story, 90 x 200 ft. ice plant at West 58th St. and Herman Ave., Cleveland, O., to H. K. Ferguson Co., Hanna Bldg., Cleveland. Estimated cost $150,000.

Ice Plant—Mission Ice Co., H. G. Terry, 226 Rivas St., San Antonio, Tex., will receive bids about Feb. 28, for the construction of a 25 ton ice plant at Zarzamora St. and Culebra Rd. Estimated cost $40,000. Private plans.

Ice Plant—Pawtucket Ice Co., H. L. Russell, 126 Main St., Pawtucket, R. I., will soon award contract for a 60 x 110 ft. artificial ice plant. R. E. Palmer, 58 Suffolk St., Holyoke, is architect. York Ice Machinery Corp., 200 Causeway St., Boston, is engineer.

Ice Plant—S. Stone Jr. & Co., Masonic Temple Bldg., New Orleans, La., Archts., will soon award contract for the construction of a 1 story, 90 x 160 ft. ice plant on Carrollton St. Estimated cost $45,000. Architect not announced.

Ice Plant — Sunset Ice & Cold Storage Co., San Antonio, Tex., awarded contract for the construction of a 15 ton ice plant at 130 Lamar St. to L. T. Wright & Co., c/o Builders Exchange Bldg., San Antonio. Estimated cost $28,000.

Ice and Packing Plants—Caps & Parker, Donna, Tex., will build a 60 ton ice plant, also connecting packing plant. Estimated cost $60,000. Private plans.

Icing Platform — Pacific Fruit Express Co., H. T. Whyte, Asst. Gen. Mgr. and Engr., 238 South Pacific Bldg., San Francisco, Calif., awarded contract for the construction of an icing platform to include inclined conveyor, icing and unloading machinery, etc., at Hearne, Tex. to R. E. McKee, El Paso, Tex. Estimated cost $33,000.

Liquor Blending Plant—Monarch Liquers Ltd., Riverside, Ont., awarded contract for the construction of a 4 story, 50 x 120 ft. liquor blending plant to J. W. Strain, 227 Victoria Rd., Walkerville, Ont. Estimated cost $100,000.

Market Building—Upham's Corner Market, 600 Columbia Rd., Dorchester, Mass., will soon award contract for a 2 story, 100 x 220 ft. market building on Chestnut St., Quincy. Estimated cost $500,000. W. M. Bacon, 27 Kilby St., Boston, is architect.

Meat Packing Plant—J. Morrell & Co., 75 Commercial St., Boston, Mass., will soon award contract for a 2 story, 90 x 115 ft. packing plant at Cambridge, Mass. Estimated cost $100,000. Henschien & McLaren, 1637 Prairie Ave., Chicago, Ill., are architects.

Milk Bottling Plant Addition — Pevely Dairy Co., 1001 South Grand Blvd., St. Louis, Mo., awarded contract for a 3 story, 61 x 68 ft. addition to milk bottling plant to Fruin-Colnon Construction Co., 501 Merchants Laclede Bldg., St. Louis. Estimated cost $50,000.

Milk Depot—Ferndale Farms, 1678 Bergen St., Brooklyn, N. Y., is having revised plans prepared for the construction of a milk depot. Estimated cost $40,000. E. M. Adelsohn, 26 Court St., Brooklyn, is architect.

Milk Plant Addition — Nashville Pure Milk Co., 1401 Church St., Nashville, Tenn., awarded contract for a 2 story addition to milk plant to include laboratories for milk products, butter and bottling processes, etc. to Foster, Creighton Co., Fourth and First National Bank Bldg., Nashville. Estimated cost $200,000.

Milk and Ice Plant—Pure Milk & Ice Co., Nacogdoches, Tex., awarded contract for the construction of a milk and ice plant to include refrigeration for milk, milk bottling equipment and small ice machinery plant for producing ice to Hatch & Kingham, Nacogdoches, Tex. Estimated cost $75,000.

Orange Juice Plant — Orange County Juice Co., Orange, Tex., awarded contract for a 1 and 2 story, 100 x 200 ft. plant at Chestnut St. to H. C. Brookbank, Tustin. Estimated cost $50,000.

Packing Plant — Alexander Marketing Co., San Benito, Tex., will build a 1 story, 40 x 70 ft. packing plant for fruits, citrus, vegetables, etc. Private plans.

Packing Plant — Co-Operative Packers Ltd., J. Little, Pres., Shelbourne, Ont., plans the construction of a packing plant on East Barrie St., Barrie, Ont. Estimated cost $100,000. Complete equipment will be required.

Packing Plant—Escondido Lemon Association, N. Matzen, Pres., Escondido, Calif., is having plans prepared for a 2 story, 150 x 160 ft. packing plant. Estimated cost $130,000.

Packing Plant—John Morrell & Co., 75 Commercial St., Boston, Mass., awarded contract for the construction of a 1 story, 90 x 115 ft. packing plant on Bridge St. to J. M. Tobin Inc., 40 Central St., Boston. Estimated cost $100,000.

Packing Plant Addition—Banfield Packing Co., 915 East Apache St., Tulsa, Okla., will soon receive bids for the construction of a 3 story, 75 x 150 ft. addition to packing plant. Estimated cost $250,000.

Packing and Processing Plant — San Joaquin Fig Growers' Association, B. James, Pres., 1352 Fourth St., Oakland, Calif., is having preliminary plans prepared for the construction of a packing and processing plant at Stockton. Estimated cost $40,000.

Pie Factory—Los Angeles Pie Co., 1720 Hooper Ave., Los Angeles, Calif., will build a 1 story, 60 x 160 ft. factory at 1645 Tarlton St. J. Allen, 1210 West 90th St., Los Angeles, is architect. Work will be done by owners forces.

Produce Terminal — Michigan Central Railroad Co., M. C. Terminal Detroit, Mich., awarded contract for a 150 x 1,250 ft. produce terminal building at 12th St. and Michigan Central Rd. to Walbridge Aldinger Co., 2312 Penobscot Bldg., Detroit. Estimated cost $500,000.

Seed Elevator Equipment—O. S. Hunter, Durham, Ont., prices on complete new equipment to cost $50,000 for seed elevator recently destroyed by fire.

Sugar Refinery Addition — Holly Sugar Corp., Tracy, Calif., awarded contract for addition to sugar refinery to Dyer Construction Co., Cleveland, O. Estimated cost including equipment $260,000 will be installed.

Sugar Refinery — American Beet Sugar Co., Steel Bldg., Denver, Colo., is having preliminary plans prepared for the construction of a sugar refinery at Belmond, Ia. Estimated cost $1,000,000. F. H. Ballou, c/o owner, is engineer.